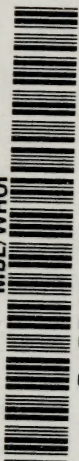


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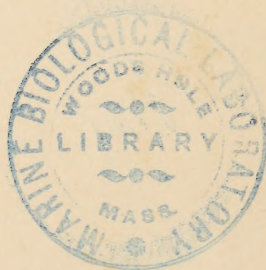


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BRITISH
SESSILE-EYED CRUSTACEA.



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SIDNEY I. SMITH,
New Haven, Conn.
A HISTORY

OF THE

BRITISH

SESSILE-EYED CRUSTACEA.

BY

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AND

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IN TWO VOLUMES.—VOL. I.



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INTRODUCTION.

THE term "Sessile-eyed" has been applied to the order of crustaceous animals forming the subject of this work in contradistinction to that of the "Stalk-eyed" order, of which Professor Bell has given an account in a preceding volume of this series. The name, with its Greek equivalent, *Edriophthalma*, was first given by Dr. Leach, and has been recognized by all subsequent naturalists. It must not, however, be understood to characterize every genus that should be classed in the order. Among the *Isopoda*, the genera of *Tanais*, *Paratanais*, *Apseudes*, and *Munna*, have their eyes fixed on pedicles. In the first of these genera, the structure differs so much in character from that of the normal *Isopoda*, that it has been classed with the Stalk-eyed Crustacea by Fritz Müller and Anton Dohrn. In this work we have placed it in an intermediate position between the *Amphipoda* and the *Isopoda*; its most important structural characters holding a position nearer, but intermediate in relation between, these two orders than they bear to the Stalk-eyed Crustacea. While, therefore, the eyes may be considered (as they have been since the days of the Swedish naturalist, Linnæus) as a ready and convenient means of classification, separating one great division from another, this character must be received as only an approximation to a

general law. So common, however, is it, and so ready of discernment, that it will probably be retained, even after a more perfect, but less readily detective, system of natural arrangement be discovered.

The term was at first applied so as to embrace all Crustacea that were not contained in the Stalk-eyed order, with the exception of the *Cirripedia*. It is still so retained in Mr. Dana's "Classification of Crustacea," and consequently embraces a large number of forms, exclusive of those described in this work, which vary so considerably from each other, that we believe it is neither natural nor desirable to group them under one definition. In the present volumes, we speak of the Sessile-eyed Crustacea as constituting a legion between the Stalk-eyed (*Podophthalma*) and the Entomostracous Crustacea. But the great difference of character in some animals of this legion from the others induced Latreille to divide it into two orders, naming them respectively after the structure of their locomotive appendages, *Amphipoda* and *Isopoda*. Another division was proposed by the same author, and very generally adopted, namely, the *Læmipoda*, or *Læmodipoda*. The animals that constituted this supposed order differ from the normal species of the *Amphipoda* only in the absence and deficiency of parts; consequently, in this work, they are viewed as an aberrant group of the order; whereas Latreille first placed the animals of this group in the order *Isopoda*,* and Lamarck united them with the *Amphipoda* and *Isopoda* as members of one family only, under the name of *Arthrocephalés*, or *Capités*. Dumeril, in his "Zoologie Analytique," united the *Amphipoda* with the *Stomapoda*, the point of similarity being the separation of the head from the body.

The term *Tetradecapoda* has been proposed for the

* Dictionnaire d'Hist. Nat.

Sessile-eyed Crustacea by M. Blainville, in contradistinction to that of *Decapoda*: the one being defined by having fourteen legs, the other having only ten. But this, upon the most superficial examination, will be found to be the most imperfect character, not only in usefulness, but also in appearance. Not only all the *Stomapoda*, but even the *Macrura*, below the family of *Palæmonidæ*, possess fourteen fully developed pediform limbs; and even in the *Brachyura* and *Anomura*, the anterior appendages that protect and supply the mouth are legs altered for a necessary purpose, and not really oral appendages; consequently, the distinction in structure that the two separate names would lead a student to expect, does not exist. The only true *Decapoda* are *Caprella* and *Anceus*, and these belong, in the present system of classification, to the *Tetradecapoda*.

The term *Choristopoda*, or separate-footed, has been applied by Mr. Dana, who uses it as synonymous with *Tetradecapoda* of Blainville and our term of Sessile-eyed, over which it appears to possess no advantage, without which it is unwise to add to the already too numerous list of synonyms. Thus it will be perceived that, in our consideration of the orders treated of in this work, we consider that the Sessile-eyed Crustacea bear a nearer structural affinity with the Stalk-eyed Crustacea than with the *Trilobita*, *Entomostraca*, and *Rotatoria*, which Mr. Dana unites into the one division under the term of Sessile-eyed Crustacea.

The classification that we have adopted nearly resembles the system of arrangement adopted by Milne Edwards in his "Histoire des Crustacés;" but, in his classification, the aberrant *Amphipoda* are admitted to a rank of equal importance to that of the *Amphipoda*, whereas certain very exceptional forms of *Isopoda* are only distinguished as a separate family of *Isopoda*.

The aberrant group of *Isopoda*, although containing, and perhaps based upon, the most characteristic genus of Dana's supposed order of *Anisopoda*, yet must not be considered synonymous with it, since all the parasitic forms that possess such extremely aberrant characters in the adult females, possess the true character of the normal *Isopod*, both in the young and adult male. Thus the genera *Arcturus*, *Bopyrus*, and the rest of the parasitic *Amphipoda*, we have classified with the normal *Isopoda*. Nor can we think that the only feature that assimilates *Arcturus* to the *Amphipoda* (the forward direction of the second pair of pereopoda), can be considered of sufficient importance to narrow the distinction between it and the *Amphipoda*, whereas other characters of greater importance induce a natural separation that is strongly marked.

The consideration of the structure of the Sessile-eyed Crustacea has, until recently, but little attracted the attention of zoologists. The observations of Loven, Lilljeborg, Goës, De la Valette, Grube, Fritz Müller, Anton Dohrn, Schöbl, Schiödte, and others, have done much to show the large amount of novel and interesting subjects of biological knowledge that have been, and still are to be, developed by the study of this hitherto much neglected class of animals.

The structure of these animals, though offering a very palpable distinction from the higher forms, is indubitably formed upon the same common type. So clearly can this be demonstrated, that we are somewhat surprised to find that Mr. Dana ("United States Exploring Expedition," vol. i. p. 1404) should say that "they have not a macrural characteristic, but have a body divided into as many segments as they have legs (hence our name *Choristopoda*); the antennæ, legs, and whole structure are distinct in type."

That every segment has its appendage is a law common to all Crustacea. In the Stalk-eyed order, the development of the cephalon is carried to a monstrous extent as a shield or carapace, covering and protecting, in some cases, all the segments of the pereion. When the carapace is so developed, the necessity for perfect segments in the latter does not exist, consequently the dorsal surface is wanting; but the lateral portion is always present. In the Sessile-eyed Crustacea this enlargement of the cephalon does not exist, and the absence of a carapace permits the development of the dorsal surface of the segments of the pereion. A careful examination of the appendages of the head will clearly show the same number of segments associated together as is found to exist in the macrural forms, consequently the head or cephalon in the Sessile-eyed Crustacea homologizes with the carapace in those Crustacea that have their eyes supported on foot-stalks. Gradually, from the *Brachyura*, it decreases through each succeeding order, and this, apparently, in relative degree with the separation of the nervous system into separate ganglia, obedient to a common law of depreciation, which in the Sessile-eyed Crustacea appears to reach a lower limit in the *Isopoda* than in the *Amphipoda*.

The appendages that are supported by the cephalon are various in form, and generally associated with the senses.

The first, or most anterior pair, are the eyes, which, from the circumstance of being closely impacted within the dermal skeleton, give the name of Sessile-eyed to the legion, as above mentioned. This position is not invariably the case, since in the genera *Tanais*, *Paratanais*, *Apseudes*, &c., the eyes are carried on elevated stalks. In the *Isopoda* these organs appear to be more perfectly developed than in the *Amphipoda*, except, perhaps, in *Hyperina*, where their monstrous development deprives

the head of its normal form. In the *Isopoda* generally, the lenses of the eyes are well developed, and lodged in the texture of the skeleton of the animal, which is frequently thinned out to an extreme tenuity, and marked with numerous facets, corresponding with the many lenses belonging to the organ. In the *Amphipoda*, the lenses either are not so numerous or are less apparent, and the dermal tissue that covers the organ is thick and unchanged in character. This condition is carried to the greatest limit in the *Phoxides*, *Ampeliscides*, and those *Gammarides* that are inhabitants of deep and dark wells, where no rudiments of eyes are apparent, except in the presence of some coloured and ill-defined pigment cells, which in the *Phoxides* coalesce into a single organ. In the genus *Ampelisca* this pigment of colouring is associated on each side with two solitary lenses, that appear to be built into, and form part of, the dermal covering.

It appears to be a law in the decreasing structural importance of Crustacea, that the segment supporting the appendages shall disappear before the appendage that it supports. In the Sessile-eyed legion, the eyes alone remain, the segment and the articulating portion of the appendage not being developed; the eyes are developed in most families so deeply within the head, that they generally appear to be behind the antennæ, and sometimes, as in *Phoxus*, at the extremity of the frontal rostrum; in others, as *Erichthonius*, on a projecting lobe of the head, situated between the two pairs of antennæ, in which position, owing, probably, to the insufficient depth of structure, the eye is borne on the internal surface, where it is lodged as a protuberance. But whatever may be the position of these organs, the variability of situation can only be consistent with certain advantages under peculiar conditions.

In the young animal the number of facets is fewer in

the eye than in the adult state. In the genus *Gammarus*, the number of lenses in the young is first eight or ten, whilst in the adult they number from forty to fifty.

The superior or first pair of antennæ we consider, contrary to the opinion of Mr. Dana, to be formed on the same type as those of the *Macrura*. Each of them consists of three distinctly formed joints and a flagellum, with sometimes a more or less important secondary appendage. We have long since expressed our opinion that in these organs lies the seat of auditory consciousness, and we are still inclined to retain that opinion. We are aware of the elaborate experiments of Dr. Von Hensen, which tend to demonstrate the existence of auditory cilia on several parts of the animal, as the superior antennæ, (in which Professor Huxley was the first to demonstrate, in some exotic *Macrura*, the presence of highly refracting otolithes,) on the inferior antennæ, as well on the caudal appendages as in the external branch of the posterior pleopoda, on which Van Beneden has discovered, and we have seen, what appear to be well-formed otolithes, of the same type as those found in the first joint of the anterior pair of antennæ in *Mysis*, &c. But we have always attributed to certain very delicate membranous cilia of various forms, found on the primary flagellum only of the superior antennæ, and present, under normal conditions, in nearly every family of Crustacea, the power of conveying impressions of sound. But these membranous cilia are very distinct from the auditory hairs of Dr. Von Hensen.*

That the superior antennæ are, in their most normal development, purely aquatic organs, we see in the depreciation of their character in the partly marine genera

* An elaborate memoir on the auditory organs of the Crustacea, by Dr. V. Hensen, was published in *Zeitschr. f. Wissensch. Zoologie*, xiii. Bd. 3. Hft. 1863, an abstract of which may be seen in the *Zoological Record* for 1864.

Orchestia and *Talitrus*, and their rudimentary condition in the terrestrial *Isopoda*.

The inferior or second pair of antennæ are formed on the simplest character of the *Macrural* type, and consist of a peduncle with five joints, of which the first two, (the homotypes of the coxa and basis joints of the true leg,) are very closely associated, and carry the olfactory denticle. In the higher groups, the two basal joints are fused together, and often with the nearest part of the segment to which they belong. Sometimes, so perfect is the union, that not the slightest trace of the relation of one part to another is capable of being detected. This complete association of the appendage with the body of the animal lessens with the degradation of the creature, until we find the five separate joints distinguishable from each other and from the body of the animal.

The denticle at the base of the second pair of antennæ in the *Amphipoda* (Fig. 1), homologizes with a perforated

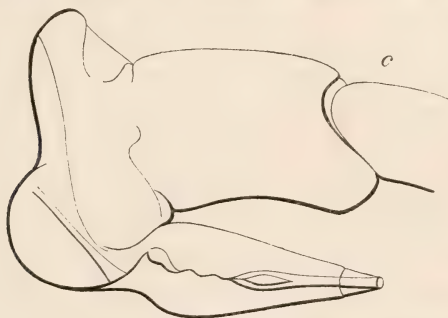


FIG. 1.

tubercle situated on the ventral surface of the cephalon in the *Brachyura*, laterally anterior to the oral apparatus, and indeed covered by some of the appendages, in the higher groups of the class. The denticle in the *Amphipoda*, upon close examination, appears to have an open extremity, through which a cylindrical tube, retained in its place by membranous ligatures, protrudes. This tube closes at the

internal extremity rather suddenly, and encloses the elongated bulbous extremity of a nerve-thread, that proceeds from a second bulb or nerve-ganglion implanted at the base of the denticle. This denticle, though frequent, is not invariably present. In the genera *Orchestia* and *Talitrus*, the two basal joints of the antennæ are built into the anterior wall of the cephalon, so as to be generally mistaken for it; while in others, as also in the *Isopoda*, every trace of the denticle is lost (Fig. 2).

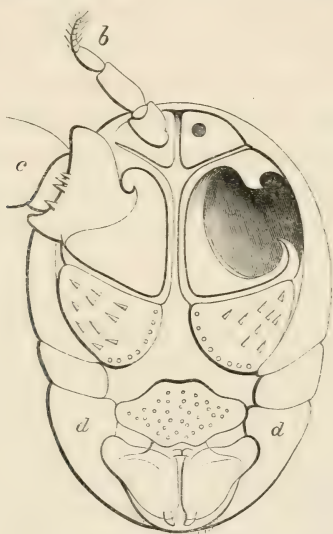


FIG. 2.

There is no secondary appendage to the inferior antennæ, and, with the exception of the squamiform plate in the *Macrura*, it is never found in Crustacea; nor is it invariably a macrurous condition, since in some genera it is entirely absent; and even in *Palinurus*, a most typical form, it is lost as an appendage, being distinguishable only in the outline impressed in the walls of the fourth joint of the antennæ.

The flagellum in all Crustacea originates, in the upper antennæ, after the third perfect joint; in the lower, after

the fifth; and in every case the secondary appendage, whether in the form of a scale attached to the lower, or a filamentary appendage, or several, invariably in upper and lower alike arises from the distal extremity of the third.

This appears to be a very constant condition with all the appendages of the cephalon, pereion, and pleon. The most frequent exception exists in the first joint or coxa, as exemplified in the branchial appendages and the ovigerous plates of the female *Amphipoda* and *Iso-poda*. According to our experience, whenever any secondary appendage is developed from the second joint or basis, it exists more as a rudimentary effort than as a true organ. After the third joint, we are not aware that any secondary appendage is ever produced, though in some genera, as in *Palæmon*, the primary flagellum of the anterior antennæ occasionally divides or sends off a smaller one.

The flagellum in the Sessile-eyed Crustacea is generally multi-articulate. It attains its most filamentary character in the sub-family *Gammarides*; but in some genera many, and sometimes all, the numerous articuli coalesce into one or more joints, as in *Podocerus*, *Corophium*, *Chelura*, the terrestrial *Isopods*, &c., in all which cases they become organs assisting in climbing and grasping. Unlike the superior antennæ, the inferior pair appears to be always present, and we only know of their being reduced to an immature condition in those Crustacea that pass their lives as parasites upon others, as the *Bopyridæ*, *Hyperiidæ*, and *Cyamus*, a circumstance that induces us to believe that the second pair of antennæ is the seat of a sense which undergoes but slight modifications to enable it to be equally distinguishable whether in air or water, since the *Isopoda* and *Orchestia*, in which the antennæ are well developed, are terrestrial.

The oral apparatus in most Crustacea is a somewhat

complicated series of organs. It is built up of many separate pairs of appendages, those belonging to the higher groups of Crustacea being the most numerous. In the Sessile-eyed orders, the mandibles are separated from the second or posterior pair of antennæ by the ventral surface of the fourth or mandibular segment, and a protuberance that, from its position, is called the labrum, or anterior lip.

In the *Amphipoda*, the epistome is generally placed vertically, and occasionally produced anteriorly into a sharp spear-like process. In many, however, as also in the *Isopoda*, it exists as a plate that gives strength and solidity to the fulcrum on which the mandibles rest.

The labrum is divided into two parts, the lower of which moves on the upper by a slight hinge, and assists in perfecting the shutting of the mouth. The free margin is generally clothed with short hairs, often of club-shaped and deformed appearance.

The mandibles are powerful organs, impinging against each other at their extremities, the biting edge being in the median line. In the Sessile-eyed Crustacea, they bear a near resemblance to the same appendages in the larval condition of the highest order of Crustacea. The anterior or biting margin of the mandible is generally divided into several short and strong denticles, though in some genera it is smooth and even. Within the denticular margin a second process generally exists, a smaller repetition of the first, and which commonly, when present, is attached by a movable joint. Near the centre of the mandible is a large internally projecting process, that corresponds with and meets a similar process in the opposite mandible, and is evidently adapted for mastication, and may with propriety be named the molar tubercle. It forms, generally, with the anterior or

incisive margin, the two extremities or horns of a crescent. The second, or articulated process, is situated between the two, but somewhat nearer the anterior margin. It appears to be able to assist in carrying the food from the one point to the other, from the biting to the grinding surfaces, between which and the molar tubercle are frequently a row of strong and curved spines that facilitate the process.

The mandibles are moved by powerful muscles attached to the inner surface of the dorsal part of the cephalon, corresponding with the homological parts that are attached to the inner dorsal surface of the carapace of the higher Crustacea.

The surface of the molar tubercle is granulated with rows of minute denticles that are only visible under a strong magnifying power. In some species, a long and slender ciliated filament is appended to the margin of the tubercle that may be associated with the sense of taste.

The mandibles are no exception to the fact that all appendages are but modified legs. In all Crustacea, we think that it can readily be demonstrated that the mandible consists of the first three joints being closely ankylosed. The small appendage, that generally consists of three freely articulated joints, represents the fourth, fifth, and sixth joints; the seventh, or dactylos, being seldom present. An homological examination of the genera *Nebalia* and *Pontia*, with *Homarus*, together with the homotypical parts in other appendages in the same animals, we think will readily confirm this opinion. The small three-jointed appendage to the mandible is wanting in but few genera, excepting in the terrestrial *Isopoda* and *Amphipoda*. In aquatic species it is, with few exceptions, always present, and appears to be of efficient use in directing floating material towards the mouth.

In some parasitic families these organs undergo an extreme amount of modification. This is much more exaggerated in the *Isopoda* than in the *Amphipoda*. Among the *Cyami*, the oral appendages are all reduced and somewhat modified, but in the *Cymothoidæ*, *Bopyridæ*, and *Anceidæ*, among the *Isopoda*, they appear to lose much of their normal character, and fulfil the office of a sucking apparatus. In the formation of this organ one or more pairs of the appendages may be implicated, as is shown in an elaborate memoir by Schiödte* on the subject. The manner in which the organ is developed in *Ione* from the mandibles, we have described at page 253, vol. ii. of this Work.

In the *Anceidæ*, the appendages of the mouth in the young stage are sharp and lanceolate, the sucking organ being apparently modified from the labrum, where, as in the adult animals, the oral aperture, with the supplying appendages, are lost, or converted into members useful for other purposes.

In the genus *Brachyscelus*, and others of the family *Platyscelidæ*, the appendages of the oral apparatus are reduced to a single pair of membranous leaf-like organs; nor have we been enabled to trace any different character of organ to take the place of the lost ones. Both in the adult and young animal, the mouth appears to be reduced to a rudimentary and simple character: an aperture with the probable power of opening and closing at will being the most that we have been enabled to determine.

The first or anterior maxillæ (Siagnopoda) are separated from the mandibles by a posterior lip, which differs in the *Amphipoda*—or at least in some genera—in being cleft longitudinally in the median line, and is termed the labium;

* Natur. Hist. Tidssk. 1866, p. 168—206.

it appears to be capable of being slightly moved, and probably assists the mandibles in the process of manducation. There are three pairs of Siagnopoda, the two anterior of which are extremely delicate foliaceous appendages, whilst the third is much more robust, yet still possessing a foliaceous character, particularly as regards the three or four basal joints. In some genera, as in *Sulcator*, some of the plates, particularly of the two anterior pairs, are folded so as to become two or three parallel leaves, one of which, on the first pair in *Sulcator*, is developed into a prominent lobe, containing large nucleated cells. Of the office or use of this gland-like organ we can offer no suggestion, not having met with any analogue in the order.

The two anterior pairs, the maxillæ of authors, vary somewhat in their form in genera, and very much between the *Isopoda* and *Amphipoda*. In the parasitic species of both orders, they are defective, and sometimes wholly wanting.

The third Siagnopod, or first maxillipede of authors in these orders, is a true cephalic appendage, and covers the organs of the mouth as a protecting operculum.

These last three pairs of appendages are concentrated about the mouth, the segments to which they belong being represented by the ventral portions only, and these are closely fused together, from the sides of which, in the genus *Talitrus*, originate two bony processes, that meet, without uniting, near the internal centre of the head, there spreading out into flattened plates, from each of which a thin and somewhat delicate process is directed anteriorly and slightly upwards; the stomach is supported by them in its position. This osseous internal arch, that we described in the British Association Report "On the British *Edriophthalma*," 1855, Professor Huxley has, in his lectures at the Royal College of Surgeons, published in the

Medical Times and Gazette, vol. xxxvi. p. 467, 7th November, 1857, named the *Endophragmal arch* (Fig. 3, En.).

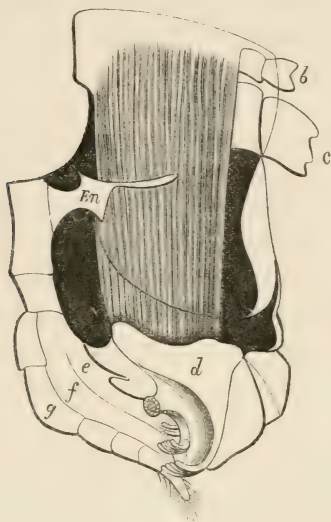


FIG. 3.

The seven segments which succeed the cephalon, or head, are, in the higher orders, protected by the carapace. This becomes gradually smaller in the descending series, until, in the Sessile-eyed Crustacea, each segment is exposed and developed into a perfect ring, analogous in appearance to the segments of the pleon in the *Macrura*. The several appendages that belong to the segments of the pereion are locomotive in their character, some being perfectly natatorial or ambulatory, others adapted for climbing and grasping. In this respect the two anterior pairs in the *Amphipoda* are most constant in their adaptation. The probability is, that these last are never in the *Amphipoda* used, except for carrying food to the mouth, or more rarely for climbing, or occasionally grasping the female. In this they are found to possess

a feature that, with the exception of the *Isopoda*, is common to most Crustacea, even including the aberrant *Isopods*. We have thought it convenient to describe them under a name distinguishing them from the true ambulatory legs, although by doing so we must include some genera of *Isopoda*, where they assimilate to and fulfil the conditions of true walking-legs. In the *Brachyura*, the gnathopoda are developed, so as to serve chiefly as protecting the oral apparatus. In the *Macrura*, they assume a pediform appearance, and are used in seizing and holding food. In the *Stomapoda*, the *Squillidæ* have them developed into formidable prehensile organs. This change takes place gradually from the highest Crustaceans to the *Amphipoda*. The character is still increased in some of the aberrant genera, until it becomes a perfectly didactyle chela. In the *Isopoda*, the prehensile character may be said to be lost, presenting itself only occasionally in the anterior pair, in the male animals.

The five remaining pairs of walking-legs (the pereopoda) homologize with the five pairs of legs in the Stalk-eyed Crustacea, that give the name of *Decapoda* to the order. These are produced on a somewhat different plan from the walking-legs of the Stalk-eyed Crustacea, the modification, as it appears to us, taking place in accordance with certain necessities that have arisen from the depreciation of their general development. The two anterior pairs of legs, or gnathopoda, are developed upon one type; the two succeeding pairs, or first and second pairs of pereopoda, on a second; and the last three on a third.

The normally developed appendage of every kind in Crustacea consists of seven joints. In the *Brachyura*, the first, or coxa, is ankylosed with, and forms part of,

the sternum. In the *Macrura*, it also forms part of the sternum, but the separation is distinguishable by a free and movable articulation. In the Sessile-eyed Crustacea, the coxa is more laterally situated, and very firmly attached, without being fused to the segment of the body. With few exceptions, it is developed into a broad and scale-like joint, and is so large in the *Stegocephalidæ* that it covers the greater part of the animal. The object of this development is evidently to cover and protect the branchial appendages, when situated beneath the pereion. These scale-like coxæ have been considered as parts of the segments of the body of the animal to which the legs belong, and are described under the name of epimera, or side-pieces, by Professor Milne Edwards.

There is a peculiar tendency in the *Amphipoda* for the joints of the legs to be produced in a scale-like form. Besides the coxæ, the *basis*, or second joint of the three posterior pairs of pereiopoda, are almost always so developed. In *Orchestia*, the males in some species have the carpus and posterior pair of pereiopoda enlarged; in *Podocerus* and *Cerapus*, the two anterior pairs have the basis so produced; but in *Sulcator* this predisposition appears to reach the culminating point, where it is apparent in almost every joint of the appendages of the head and body.

The next division of the animal is that which we denominate the pleon. It consists of seven segments, as in each of the former divisions, and carries three kinds of appendages. The segments generally resemble those of the pereion, and, like them, carry on each side squamiform coxæ, which Professor Milne Edwards has again mistaken for epimera, or side-pieces, belonging to each respective segment. These are, both in the *Amphipoda* and *Isopoda*,

generally fused closely with the dorsal surface of the segment; but in the genus *Apseudes*, as we have shown in fig. *p*, page 148, vol. ii., they are free. Here we have a distinct exposition of the relation which the squamiform side-piece holds both to the segment and the movable bifurcate appendage. The segment is distinctly separated from the squamiform side-piece, which, articulating with it, forms the first joint of the pleopoda or swimming-leg, and is developed into a large scale-like process, to the base of which the second joint is articulated, from whence is suspended freely a third, which in its turn supports the two free plates which form the terminal appendage of the anterior pleopoda. In the *Isopoda*, as well as the *Amphipoda*, this interpretation illustrates the relation of the parts of the pleopoda to the segments of the pleon. The forms of the pleopoda may and do change, according to the law of modification of parts, to suit their requirements; but under whatever condition they may exist, they consist of three normal joints, more or less fused together, and with the segments of the pleon and a depreciation of the four terminal joints into one or a pair of movable plates, as in the *Isopoda*, or articulated flagella, as in the *Amphipoda*.

The three anterior pairs in the *Amphipoda* are developed upon this type; the two succeeding have the double appendages stiff and unyielding, and the posterior is generally variable in the different genera. In the *Isopoda*, the four anterior pleopoda are developed upon one type, while the fifth is converted into an operculum. Some variation of the anterior pairs also takes place in relation to the sex of the animal. The last, or twenty-first segment, differs from the rest in most Crustacea by not carrying any appendage. To this we know of but one exception among the Crustacea, and that is in a genus in the family

Mysidæ, discovered by Mr. Norman. The telson in the Sessile-eyed Crustacea is generally an abortive, and frequently a rudimentary, part. In the *Isopoda*, except in the genera *Apseudes* and *Anthura*, it is always fused with the preceding segment.

The composition of the dermal skeleton is, in all Crustacea, the same. In the Sessile-eyed order the texture is very thin, and seldom consolidated into a firm structure, except in certain parts of some few genera where strength is required, as in the chelæ of large-handed species. This circumstance offers the advantages of enabling the observer to examine the internal structure of the animal without the necessity of dissection. During the life of the animal, we are enabled to trace the currents of circulation of the blood, the motion of the cardiac vessel, and the position of the internal organs in relation to each other.

This delicacy of the structure also enables us to discover the very diverse and varied arrangement of the material of which it is built up, and demonstrates (contrary to our anticipations) that in species often closely allied, there is a very distinct appearance in the microscopic structure. It may prove to be of some importance in determining species, but care should be taken that the several specimens examined should be taken from the same part of the skin of each animal. We have illustrated many of these varieties of structure throughout the work, in connection with the animals to which each belongs.

Frequently, besides the markings that illustrate the manner in which the skin is built up, there is another that is not always constant, consisting of a series of small perforations through the tissue, which in some species assume a waved appearance, as may be observed in the genus *Ampelisca*.

Although we believe that the microscopic examination of the skeleton in these animals would frequently facilitate the determination of doubtful species, yet it is a condition that is not to be trusted to alone, inasmuch as it is not unfrequently found that similar appearances are repeated in very distinct genera. Examples of this may be found on comparing the structure of *Megamæra Othonis* with that of *Chelura terebans*.

The form and structure of the hairs that are found on these animals, when microscopically examined, are of a very distinct and different character. They not only vary in separate species, but differ in several parts of the same animal. In *Sulcator* there are no less than twelve varieties. Some are plain, stiff, bristle-like spines of various lengths, which are generally attached to the margins of the limbs. A second variety, longer in general form, fringed on one side with a series of fine, straight, teeth-like processes, possessing a rake-like character, is attached to the third siagnopod ; as is also

A third, that differs from the preceding in having the teeth bent in a curve directed to the base.

A fourth is found on the carpus of the second pair of gnathopoda. In this position are also two varieties, which originate from closely approximating bases. One is long, slender, and clean to the tip, where a few exquisitely fine cilia appear, which give to the extremity a bulbous appearance, that can be resolved only with a high (700) magnifying power. The other, or

The fifth, is short, broad, flat, terminating in a point that is sharply bent upon itself; the lateral margins are likewise furnished with a series of sharp denticles, ranged on each side, pointing to the base for about two-thirds of its length.

A sixth is found on the propodos of the same appen-

dage; comprising two forms moulded on the type of the two preceding; the shorter changing the hooked extremity for a bulbous termination, and the shaft being armed with teeth on one side only.

A seventh exists on the mandibular appendage: it is straight, enlarged and rounded at the apex, and serrated on one side; while

An eighth differs from the preceding in being more robust, slightly turned at the extremity, and smooth along the margins, excepting a single short, straight, distally directed cilium.

A ninth resembles the sixth, but wants the serrated margin, and carries on the convex side a fine cilium. This variety is found on the first pair of gnathopoda.

The tenth, eleventh, and twelfth varieties are plumose, and found mostly on the second pair of antennæ, though a few are present on several other parts of the animal. One is short and obtuse, being crowned with numerous radiating cilia. It is to this variety that we understand Professor Hensen attributes the power of hearing.

This great variety of form in the hairs of a single species is not constant. In the genus *Talitrus*, there is but a single form of hair, which is but little modified in the various parts of the animal. It is short, stiff, and blunt, and exhibits under the microscope a tendency to a spiral condition for about one-fourth from the extremity, at which distance a second but smaller process exists, so that the hair might be characterized as being forked, but for the unequal proportion of the two branches. This kind of hair is by no means rare in the *Amphipoda*. Those found in *Orchestia*, *Talorchestia*, *Nicea*, *Gammarus*, &c., are but modifications of the same form. This great variation in the form of the hairs is more or less common to all Crustacea. Those in *Carcinus mænas* have been

described and figured by Dr. McIntosh in the "Linnaean Transactions" for 1862, p. 79. The hairs are not only various in form, but sometimes they will be found constant in number. Thus, in the genus *Phoxus*, we have found the number of hairs on the coxæ of the three or four anterior pairs of legs to be constant in the respective species.

EXUVIATION AND REPRODUCTION OF LIMBS.

The power of Crustacea to throw off their skin and replace it by a new one, has long been a recognized fact in all the higher orders. It is, however, on the authority of Mr. Couch, stated by Mr. Bell, in a note to his introduction to the "Stalk-eyed Crustacea," p. lxi., "that the families in which the eyes are sessile in their adult growth . . . do not exuviate, or voluntarily throw off their limbs."

These Crustacea, however, like their higher congeners, renew their integumentary tissues periodically. This is equally true with regard to the alimentary canal, which is cast in connection with the skeleton. The animal shows no appreciable difference in its habits at the time immediately anterior to its throwing off its exuviae. It swims about very actively until the hour of moulting arrives, when it seeks a place of comparative security, where it may remain uninterrupted the necessary length of time for the completion of the process.

In this position it grasps with the anterior pair of gnathopoda some fixed and conveniently secure material for an anchorage. Here the labour is commenced, and, judging by the quietness and rapidity of the process, appears to be one of no great discomfort. During the

operation, at almost any stage, the animal, if disturbed, is capable of removing itself to a more quiet and secure place.

The process appears to be the result of an internal growth of the animal, which becoming too large, the skin splits at the margin of the dorsal and sternal arches of the three anterior segments of the pereion, the inferior arch carrying the legs, inclusive of the coxæ.

The anterior segment of the pereion extends over the posterior margin of the cephalon. At this point the attachment is broken anteriorly, and the lateral disunion of the three anterior segments allows their upper surfaces to be raised as a movable lid, through the opening of which the animal escapes from the old integuments. With some exertion, the posterior portion of the body, together with the limbs, are withdrawn, after which the head and the anterior members are removed, and the entire animal is free from the old exuviæ, which, resembling a dead individual, is left, attached to its old position. Unless disturbed, the animal, which is now extremely soft, generally rests for some time, as if exhausted, near the cast-off skeleton. Upon being disturbed, it is capable of swimming away immediately.

Mr. Harry Goodsir, in the *Edinburgh Philosophical Journal* for 1842, has described the process of exuviation, as observed by him in the genus *Caprella*.

He says that the animal, previously to the commencement of the process, "lies for a considerable time languid, and to all appearance dead. At length a slight quivering takes place all over the body, attended in a short time with more violent exertions. The skin then bursts behind the head in a transverse direction, and also down the mesial line of the abdominal surface; a few more violent exertions then free the body of its old covering. After

this the animal remains for a considerable time in a languid state, and is quite transparent and colourless."

The new creature is a perfect representation of the old one, slightly enlarged. According to our observations, every hair is produced complete. We have often seen them, convoluted and bent up within the old case, from which they only wanted to be freed to assume the erect position of the perfect hair. It has, however, contrary to our anticipation, appeared that all the hairs are not developed within each corresponding one. We have frequently observed them as a second armature, independent of the old one. This remark is particularly distinguishable in the teeth that fringe the first two siagnopoda. These have generally a dentated and forked character, which might be injured in their removal from the old and hard tissue of the rejected skin, an accident that not unfrequently befalls the branchial sacs, which are occasionally torn off and retained behind in the old case.

The power of Crustacea to throw off any of the limbs upon receiving an injury, and sometimes in consequence of fright, is well known in relation to the higher orders. The manner in which this is done has been described by Dalyell, Goodsir, and ourselves. It certainly is a remarkable power and law of reproduction, and which always takes place at the same homotypical position in every limb—that is, between the coxa and the next succeeding joint. The wound that is caused by this sudden rupture is simultaneously glazed over by a thin membrane, which must be very suddenly formed, and probably is the amputating power. Observers have very generally added as an appendage to the above interesting fact, that it is exceedingly fortunate that there is this power of voluntary amputation of the limbs, for otherwise, in consequence of the non-contractile character of the dermal covering, the

animal, upon being wounded in either of the limbs, would of necessity bleed to death. That such would be the case would appear to be extremely probable, but, like all negative evidence, is only of value in the absence of direct testimony. In the Sessile-eyed orders the animal appears to want the power of voluntarily throwing off any of its appendages, no matter how severely it may be wounded. If a leg be cut off, or in any way injured, the wound very soon after becomes cicatrized with a black scar, which remains until the next exuviation of the animal, when the entire limb is thrown off with it, and a new one commences growing.

TASTE AND DIGESTION.

The sense of the enjoyment of food, even in the highest types of the animal kingdom, exists rather in the power of parts to receive impressions than in the presence of any especial organ for the purpose. Arguing, therefore, from analogy, we should suppose that the sensation of taste in the lower animals (such as the Crustacea, and other groups in which mastication is of an imperfect character), must necessarily be rather a faculty peculiar to the mouth in general, than the result of any especial organ adapted for the purpose.

From the mouth the œsophagus leads directly to the stomach. The passage is very short, being directed upwards and forwards; it enters the stomach at the infero-anterior margin, and, as in all Crustacea, is within the limit of the cephalic region.

Just within the anterior opening of the stomach are situated two rake-like organs, the teeth being placed in a row on an arched base; they are slightly curved and dentated on the margins. They are so placed as to have

the points directed inwards, so that food can readily pass into, but cannot return again from, the stomach. The teeth on each side appear to correspond, so that they probably play an important point in tearing and lacerating the food as it passes into the stomach. Posterior to this

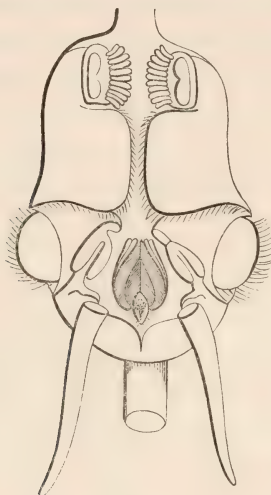


FIG. 4.

tritulating apparatus there exists four leaf-like plates, fringed with long and powerful cilia. These are attached to the lateral walls in pairs, one anterior to the other; immediately above the second or posterior pair, apparently in a chamber of its own, is a gizzard-like apparatus. We observed this most distinctly developed in *Sulcator* and *Talitrus*, and we believe it to be present in all the *Amphipoda*, and we take it to be the same appendage which Bruzelius and Loven figure and describe as the “mellanbalkan,” which is situated within the “blindsäcklikt organ,” and not, as their figures* would lead one to believe, on the floor of the stomach.

* Öfversigt af K. Vetensk. Akad. Forhandl. 1859, pl. i., figs. 1, 3, 8.

This apparatus, under a high magnifying power, is seen to consist of several closely packed rows of fine strong short hairs, very commonly arranged together in the form of a heart, the apex of which, directed anteriorly, is truncated. This appears to be the most general appearance, though in various genera it is different in form. Its appearance suggests its capability for triturating and grinding food, though it is curious that two such kinds of apparatus should exist at each end of the stomach, the one at the œsophageal entrance, the other near the pyloric outlet. The cavity in which the latter is placed has the walls thickly covered with very short hairs.

In the genus *Talitrus*, posteriorly to this apparatus are placed two long cæca, one on either side of the posterior opening of the stomach. These cæca are not universally present in other genera. They are delicate prolongations of the walls of the stomach, and gradually narrow towards their free extremity. They probably supply the stomach with a gastric juice. Still more posteriorly, at the point where the stomach terminates and the alimentary canal commences, are situated from four to six long cæca-like lobes, filled with hepatic cells. These are attached to the inferior surface, forming the liver, and are carried parallel with the alimentary canal. In the *Amphipoda*, as illustrated in *Gammarus*, the liver consists of four sub-equal lobes; in the *Isopoda*, as exemplified in *Ligia*, it is formed of six lobes, two of which are much longer than the other four, and have a slightly waved or tremulous-looking appearance towards the free extremity. From the pyloric orifice of the stomach the alimentary canal in all Crustacea passes, without curve or inflection, straight to the anal termination under the telson. To this we know of but a single exception, and that on the authority of Professor Alman, who says:—
“In *Chelura*, the alimentary canal is so arranged as to

shut one part within another, so as to admit of the head being projected forward, that the animal might eat its way into the wood that it penetrates." This we have not been able to verify, nor can we see the necessity for the disarrangement of the stomach with all its attachments, when a prolongation of the œsophageal canal would enable the animal to accomplish the work on far easier conditions.

The structure of the alimentary canal is longitudinally fibrous. In the genus *Ligia*, a little anterior to the anal termination, a series of transverse muscular bands surround it without uniting on the under surface, and probably fulfil the office of sphincter muscles.

About two-thirds of the distance between the stomach and the telson, one or two appendages are attached to the alimentary canal in the *Amphipoda*. We say one or two, because we have distinctly dissected out two in *Sulcator* (Fig. 5), but have failed to determine more than one in

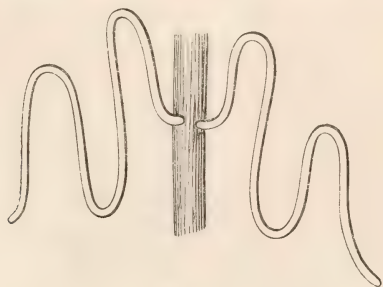


FIG. 5.

Gammarus (Fig. 6), *Mæra*, and other genera. The organ is free at one extremity, and is borne in a forward position, resting on the dorsal surface of the primævia. It is more important in appearance in some *Amphipoda* than in others; in *Sulcator* it is very long. We have never seen it in any of the *Isopoda* that we have examined, but, as far as our experience supports us, it is present both in the male and female *Amphipoda*, in the adult as well as in the

larval stage. In the younger form (Fig. 7) it is rudimentary, but scarcely more so than in *Mæra* (Fig. 8).



FIG. 6.

Immediately posterior to the point of attachment of this organ with the alimentary canal are a series of muscular bands lying transversely across the latter, which probably fulfil the office of sphincter muscles by compressing the passage just posteriorly to the efferent orifice of this supposed urinary organ. Muscles very similar in appearance are situated near the terminal exit of the alimentary tube, and probably fulfil the office of sphincter muscles to the anal outlet.

The contents of the appendage that we call the urinary organ are, under an object-glass of one-fifth focus, resolved into small round cells, containing a granular nucleus (Fig. 9). These cells are closely packed together,



FIG. 7.

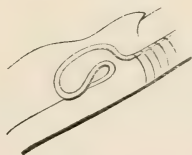


FIG. 8.

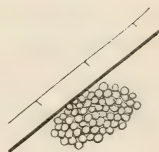


FIG. 9.

but not so as to lose their rounded character, and the whole are confined within stout walls.

CIRCULATION.

The circulatory system in the *Amphipoda* differs very importantly from that of the *Isopoda*. According to some researches of Professor Wagner* on the genus *Porcellio*, there exists a well-developed arterial system in the *Isopoda*. To establish this he adopted the method that was first shown to be practicable by M. Emile Blanchard, and which has since been successfully pursued by M. Kowalewsky on *Idotea*. A mixture of glycerine and water coloured with carmine injected through the heart into the circulatory system, demonstrates the existence of distinct vessels for the passage of the nutritive fluid. The greatest amount of arterial development, as might have been anticipated, is found to exist in the cephalic, branchial, and generative regions, which the author illustrates by diagrammatical figures. In the *Amphipoda*, the heart is situated in the dorsal region of the pereion, reaching from the posterior extremity of the first segment to the posterior of the fifth. It is a long, simple, sack-like vessel, consisting of elastic fibrous walls, possessing more the features of a great arterial vessel than that of a true heart. The blood corpuscles pass posteriorly from the pulsating heart through the entire length of the animal immediately above the alimentary canal, and the great venous course returns along the dorsal surface, probably on each side, until it reaches the last segment of the pereion, where it dips to the ventral surface and enters into the branchial sacs, where it passes down the anterior margin and up the posterior, then direct to the heart, which it enters by three lateral pulsating oblique apertures.

The heart of the *Isopoda* is situated within the dorsal surface of the pleon, except in *Tanais*, and probably

* Ann. des Sc. Nat. p. 37, vol. iv., 1865.

other general of the aberrant type, where it is situated, according to the observations of Fritz Müller, in the dorsal surface of the pereion, corresponding in position with that of the respiratory systems of the various orders.

In the *Amphipoda*, the branchiæ are by no means the simple sacs that they have been described. They are situated upon the inner surface of the coxæ, and assume the form of leaf-like hollow plates, ranged in parallel lines on each side of the sternum (Fig. 10), and are attached to

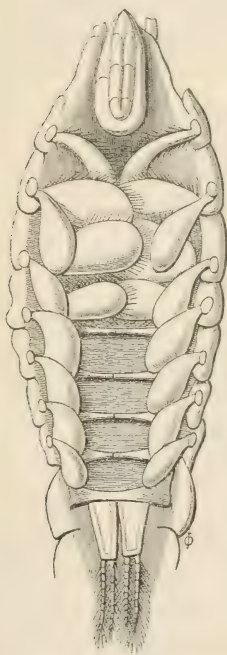


FIG. 10.

every pair of legs except the first in the females, and generally the last in males; though, in *Gammarus*, we have seen the seventh pair furnished with branchiæ as well as the preceding. In the *Aberrantia*, the number of sacs is reduced to two or three pairs. In this order they homologize with the branchiæ of the decapod type, each branchial appendage being viewed in the light of a single plate of the compound organs of the higher type; or rather, perhaps, they bear best comparison with the same organ as it appears in the larval condition in the *Brachyura*. The great distinction in their character is derived mostly from the appearance which these organs assume in the higher forms, being that of an internal position. But this is one of appearance only. The branchiæ are overcapped by the monstrous production of the cephalic shield in the Stalk-eyed orders of Crustacea, a circumstance that gives to the portion of the dermal skeleton that it covers the

character and appearance of an internal skeleton. The branchial organs are covered and protected, but they are, nevertheless, essentially external appendages. In the *Amphipoda* this condition does not exist; consequently the branchiæ are pendant in the water, and placed on the inside of the pereiopoda, the first joints of which are developed into large squaminiiform plates for their more efficient protection.

The internal structure of these organs appears to consist of thick fibrous tissue attached to the inner surface of the wall of each sac (Fig. 11). The fibrous tissue is arranged

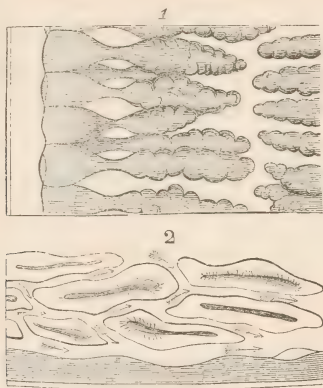


FIG. 11.

in patches of irregular form, but which correspond in their arrangement with one another. These patches are largest near their centre, and thin out towards their margins: the result is that a channel is left between each. All the channels so formed are connected together throughout the entire organ, and exhibit a continuous labyrinth, through which the blood circulates in many small streams.

Should the animal become feeble, a gradual accumulation of corpuscles takes place in different parts of the gills,

mostly at first out of the reach of the stronger currents. As the vitality of the animal diminishes, the arterial current is observed to lessen in force, until it is propelled only by jerks, coexistent with every pulsation of the heart.

RESPIRATION.

The organs of respiration in the *Isopoda* are homologically distinct from those of the *Amphipoda*. We have already stated that Professor Wagner has shown, in the genus *Porcellio*, and M. Kowalewsky in *Idotea*, that the blood in the *Isopoda* runs in arterial channels. We are

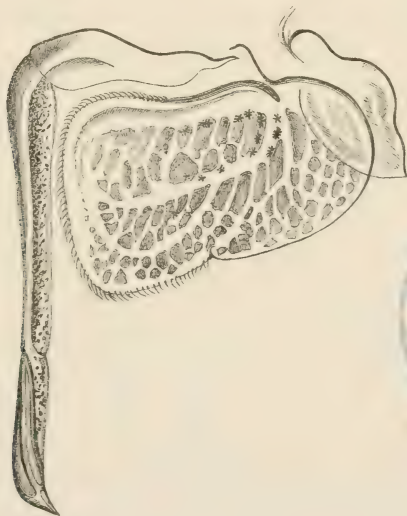


FIG. 12.

not aware that any of the *Amphipoda* have been put to the same test as the two genera named in the *Isopoda*; and certainly, to microscopic observation, the structure of the

branchial appendages and other parts of the system that from their transparency and tenuity may be conveniently examined, afford presumptive evidence against the circulation of the blood being confined to walled channels.

In the *Isopoda*, the branchial organs are variously differentiated. In some, as *Ligia*, for example, the passage of the circulating fluid through the branchial plates is clearly and distinctly defined (Fig. 12). The main artery, commencing at the base, gives off numerous lateral branches, that divide and sub-divide into a rich plexus with abundant capillary vessels. In the genus *Sphæroma*, the branchial

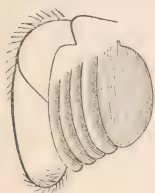


FIG. 13.

organs consist of a series of plates attached to the posterior wall of the fourth and fifth pairs of pleopoda (Fig. 13). In the degraded family of the *Bopyridæ*, the branchial organs are depauperated to the lowest degree, being in some genera little more than excrescences on the ventro-lateral

margins of the pleon.

In *Tanaïs*, the true branchiæ have not been clearly determined. It is the opinion of Dr. Fritz Müller, Van



FIG. 14.

Beneden, and Doctor Anton Dohrn, that an appendage attached to the first pair of gnathopoda is not a branchial organ, but a flabelliform appendage, that by its constant

and unvarying motion induces the surrounding medium to flow over the branchial appendages that as yet have not been discerned.

At page 122 of the second volume of this work we have described and figured one of the pereopoda with a sac-like appendage attached, that we considered as the homologue of the branchial sac in the normal *Amphipoda*.

This appendage appears not to be constant in all species, nor in all specimens of the same species. If, therefore, it be the homologue of a branchial sac, it can only be an organ of repetition.

Fritz Müller is quite positive in the assertion that no corpuscles of the circulating fluid pass into the caudal appendages, which are the seat of the branchiæ in the normal *Isopoda*.

The terrestrial *Isopoda* have the respiratory organs somewhat modified from those of the aquatic species. These have been described and figured by MM. Duvernoy, Savigny, Lereboullet, and Professor Wagner. M. Savigny, however, was the first to show that in the genus *Tylos* the system of respiration was carried on by two separate means; the one by branchiæ, as in aquatic Crustacea, the other by the spiracular air-tubes. This has been recently confirmed by Professor Wagner, who shows the relation of the opercular valves to the respiratory system, and contends that, besides their power of protecting the branchial plates from injury, and precluding the too rapid escape of moisture, they fulfil, by means of a plexus of minute vessels, situated at the base of the operculum, a pulmonary function. This organ, which he figures, has, he says, a kind of tracheal division into numerous ramifications. Seen by transmitted light it is opaque, but viewed under a direct light it is silvery white; and he contends that it is a pulmonary or tracheal chamber, which serves as a supplementary organ to the true branchiæ. This view is supported by M. Milne Edwards, as may be seen by the reference to the "Atlas du Règne Animal," (Pl. lxx. fig. l. m.), and "Leçons sur la Physiologie et l'Anatomie comparée," t. ii. p. 141. Our own opinion relative to these organs on the branchial operculum is that they are glands for the secretion of a fluid that

assists in lubricating the branchial plates in warm and strongly evaporating atmospheres. We have been led to this conclusion from finding that they diminish in size in those specimens that have been long detained in dry places.

GENERATION.

The organs of generation in the male of the Sessile-eyed Crustacea are not to be determined without great nicety in dissection and care in manipulation. We have, however, in *Sulcator* among the *Amphipoda*, and *Ligia* among the *Isopoda*, been able to examine them clearly, besides less perfectly so in the animals of other genera in both orders. Bruzelius and Loven have given their attention to the former order, and demonstrated the arrangement in the genera *Gammarus* and *Podocerus*. The male organs internally consist of a more or less oblong pair of testes, which are liable to vary somewhat in form in different genera. These testes are fitted with numerous small seminal cells. A narrow passage, or *vas deferens*, connects this organ with a second oval chamber, or *vesicula seminalis*, which is filled with long fine hair-like spermatozoa, lying thickly coiled one upon another. From the *vesicula seminalis* a narrow passage leads to the inner surface of the first joint of the seventh pair of legs, where it penetrates in each into a soft membranous external penis. We have kept species of *Amphipoda* long under observation, and paid close attention to their habits, but have hitherto failed to detect any communication between the sexes which would admit of a direct passage of the penis into the vulva of the female.

The male *Amphidod* grasps the female by one of its strong subcheliform gnathopoda, inserting its claw beneath the anterior edge of the first segment of the

pereion, whilst another is inserted beneath the posterior margin of the fourth or fifth segment. Grasping the female in this way, the male draws it into immediate contact with itself, so that the dorsal surface of the female presses against the ventral surface of the male. In this attitude, more or less firmly compressed, they swim about or rest on any convenient surface for many days. If the two be driven asunder through fear of any danger, the female seeks a place of shelter, while the male swims more actively about. Should the male swim within some little distance of its late companion, it becomes immediately aware of the circumstance; and we have seen it, after having passed the spot, abruptly turn back, seek her out, and seize her with avidity from amidst a numerous mass of others. Immediately after securing, he strikes her with two or three strong lashes of his tail. The female, rolling herself closely up, is carried off by her more powerful mate.

This contact between the two sexes is either occasionally repeated, or it may last throughout the entire period of incubation. We have frequently taken them so coupled, even when the young have been so far developed as to be enabled to leave the care of the parent. We are induced, from this fact, to believe that a series of broods may take place successively through the year, and that the erotic state of the female may exist during the period of incubation.

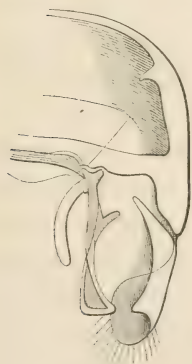


FIG. 15.

The penis (Fig. 15) is a soft membranous tube, that terminates in a small orifice. It probably has, under certain conditions, the power of becoming harder, but

it generally lies pendant from the inner side of the coxa, and is longer in some species than in others. In the genera *Proto* and *Caprella*, the penis seems to be formed out of the anterior pairs of pleopoda, just as is the case in the *Brachyura*, among the Stalk-eyed Crustacea. These observations are further confirmed by those of M. Rousel de Vauzeme on the genus *Cyamus*.

In the *Isopoda*, these organs have been carefully worked out by Siebold, Lereboullet, and Schöbl. In the genus *Ligia* (Fig. 16), we have observed on each side three testes,



FIG. 16.

consisting of long narrow vesicles, thinning away to exquisitely fine filamentary prolongations. These vesicles increase in diameter as they approach towards the efferent duct, where they rapidly become constricted before uniting with the *vas deferens*. These vesicles are filled with seminal cells, and are, we believe, the true testes. M. Lereboullet, however, in his researches on the *Oniscidae*,* states that he has observed that each of these fusiform sacs has

attached to its extremity other irregular sacs, which he regards as the principal secreting organs, and consequently the spermogenic glands or testicles. These

* Mém. sur les Crustacés de la Famille des Cloportides, par A. Lereboullet. Strasburgh, 1852.

organs, which have previously escaped the observation of anatomists, the author says, "are very irregular sacs, variable in form, simple or compound; they are generally about three-quarters of a millimetre in length, but sometimes less. They are situated deeply on each side the stomach, and are retained in their position by delicate but strong ligaments, which are covered with black pigment, which lose themselves between the muscular fasciæ of the segments of the body. These organs are full of cells, that M. Lereboullet considers as the spermatic cellules. The second vesicles, or those which we thought to be the true testes, M. Lereboullet calls *testicules accessoires*. They are, he says, three in number on each, enlarged towards the middle; they thin out insensibly towards the extremities: at one end they unite with the organs that M. Lereboullet calls the testes, and at the other they open into the spermatic reservoir—the *vesicula seminalis*. These accessory testes contain cells which are of two kinds, the larger being less numerous than the others. From these vesicles an efferent duct leads to the *vesicula seminalis*, which in *Ligia* is a long and narrow vessel, increasing in breadth gradually as it approaches its extremity, where it is suddenly constricted to a narrow outlet, which, covered with black pigment cells, leads direct to the external penis, which is situated near the centre of the ventral arch of the seventh segment of the pereion. In the males, processes of the branchial appendages are developed into stylets, (*vide fig. 12*), that we suppose must have some secondary influence in the process of fertilization.

The anatomy of the reproductive organs in the females has been carefully worked out by MM. Loven and Bruzelius in the *Amphipoda*, and by Lereboullet and Schöbl in the *Isopoda*.

According to the former authors, corroborated in part by Mr. H. Goodsir on the genus *Caprella*, by Roussel de Vauzeme on *Cyamus*, and from our own direct observation on *Gammarus*, &c., the internal organs consist of two sets of ovaries. These are long cylindrical bodies, having a duct near the middle, on the inner side, that opens into the vulva, which is situated on the inner side of the coxa of the third pair of pereiopoda, or fifth pair of legs. According to the latter authors, the structure of the same organs in the *Isopoda* is very similar; but M. Lereboullet has failed to trace the connection of the ovaries with the vulva. Herr Schöbl has been more successful in his researches on the genus *Typhloniscus*, and has figured them attached to the inner surface of the fifth pair of legs. He has also described and figured a pair of *receptaculæ seminales*, in which the male animal deposits the spermatozoa that fructifies the ovæ. According to this statement, in the *Isopoda*, if not in the *Amphipoda* also, the male impregnates the female by direct intromission—a circumstance of which we have entertained some doubt, partly arising from the formation of the animals themselves, particularly of the *Amphipoda*, in which the development of the coxæ and the narrowness of the animal would almost, it would seem, preclude the possibility of the sternal portions of the animals being brought into immediate contiguity, and also from the circumstance of having watched the animals, particularly *Asellus*, from previous to impregnation to the birth of the young, we have never seen the male in any position relative to the female except in that previously described.

The incubatory pouch, in which the ova are deposited, from the period of their fertilization until the young are developed sufficiently for independent existence, is the result of the folding over of several lamelliform plates,

generally fringed with hairs. One of these plates is developed on the inner side of each of the two pairs of gnathopoda (Fig. 17), and the two anterior pairs of pereiopoda. These plates overlies each other in a compact form, securely protecting the ova, or the immature young, from external accidents, as shown in fig. 10, p. xxxiii.



FIG. 17.

It is the opinion of Von Siebold that these appendages are periodically developed at the "époque du rut." This we have not, from our own observation, been able to verify, having taken females during all periods of the year with these appendages fully developed. They are absent on the young females. We believe, however, that, when they are once developed, they continue permanent organs, only disappearing as the result of accident.

In the *Anceidæ*, the incubatory pouch appears to belong to the three posterior segments of the pereion. By the continued growth of the ova, the pereion is reduced to a most impoverished state. The alimentary canal being in a collapsed condition, and always empty, the animal can only be viewed in the light of a great egg-producer, after the development of which an empty sac only is left, the poor remains of a worn-out animal.

The history of the development of the ovum from its impregnation to the development of the perfect larva has been best worked out by Valette St. George in the *Amphipoda*, and Anton Dohrn in the *Isopoda*. We must refer the student to the memoirs of these two authors for a detailed account of the germination and growth of the ovum in all its stages. It will suffice for us to say, that it appears to be clearly established by

all observers, that in the progressive growth of the ovum, the embryo of the *Amphipoda* is rolled within the egg in an opposite manner from that of the *Isopoda*. The latter is folded backwards, so that the ventral appendages are developed on the external surface, whereas the *Amphipoda* is bent on itself, the ventral appendages being developed on the inner surface. Dr. Fritz Müller states that, in *Tanaïs*, one of our aberrant genera, the development of the larva is after the manner of the *Amphipoda*, and not of the *Isopoda*, among which it is classified.

The length of time between the epoch of the deposition of the ovum in the incubatory pouch, and the period of the emancipation of the young animal from the care of the parent, is probably about six weeks. We have observed that to be the time required in the genus *Asellus*.

At first the egg is perfectly round. It shortly afterwards increases in one direction, becoming also somewhat larger in *Amphipoda* at one extremity. Indistinct segments are now observable. The wall of the ovum is of an elastic character, and yields to the movement of the internal embryo.

Probably about the middle of the period of incubation the embryo quits the egg, for we have constantly taken it from the pouch in a very immature condition, without being enclosed in the egg-case. The larva at this period is very immature, and enclosed within a general tunic, which, without having any apparent vital connection with the animal more than the original egg-case had, adapts itself in general form to the whole creature, and fulfils the duty of a protective tissue. As the embryo increases in dimensions and completeness of form, so the tunic corresponds in size and form. At length, freeing itself from this case, the larva strengthens in its own development, but does not immediately quit the care of the parent.

We have frequently observed the young *Talitrus* escape from the mother, upon the capture of the latter; and from the active state of their existence at this time, they appear as if they had long been capable of so acting, if they had required it. The observation of Dr. Salter on the common *Gammarus*, detailed at page 380 of the first volume of this work, fully confirm this fact—as does the circumstance that the young of *Arcturus* are protected by the mother, who supports and carries them about on the antennæ. Also we have been able to corroborate the observation of Mr. H. Goodsir, that the *Caprella* carries about its young attached to its body. These, together with the fact that many genera, particularly of the *Podoceridæ*, protect and nurse their young for some time within nests, which they build apparently for no other purpose, afford abundant proof that in these animals there is a conscious love of offspring that appears to be less marked in animals far higher in the scale of scientific classification.

When the young of *Gammarus* first swims about as a free animal, it only resembles the parent in a modified degree. The antennæ show no distinction between the peduncle and the flagellum. The latter is shorter, and consists of but five articuli, while thirty to forty may be present in the parent. This relative proportion is visible also in the lower antennæ, and in the secondary appendage of the upper, which increases with advancing age, until the adult stage is acquired.

In the structure of the eye we see the same gradual increase going on after the animal has become free. The lenses in the young are from ten to twelve in number, whereas, in the adult, from sixty to eighty may be counted. In many genera it also changes its colour, as does also that of the animal itself.

The young are generally white, or of a deep orange colour; in the adult, the colours vary apparently in relation to the presence of light and other surrounding circumstances. Occasionally the males vary in colour from the females. We see in *Orchestia* a rosy tint frequently ornamenting the great claw, and some other parts. We have also observed in *Amphithoë littorea* the well-matured males assume a yellowish appearance. This may also be the case in other genera of which we have not had the opportunity of exact observation.

In *Orchestia*, the second hand in the larva bears a near resemblance in form to the same appendage in the female—a fact that is, we believe, consistent throughout the entire class. The warty development of one of the posterior legs also increases with age.

In *Hyperia*, the larva bears but little resemblance to the parent. This was first pointed out by M. Milne Edwards, and next by Mr. Gosse. But more extended observations of the forms of these young animals were detailed by us in a memoir published in the “Annals of Natural History for 1861,” on some exotic species. Our observations on the larvæ of the parasitic *Isopods* show a wonderful similarity between the larvæ of families in distantly separated orders.

NERVOUS SYSTEM.

The nervous system was first made out in a general memoir on the subject by MM. Milne Edwards and Audouin. The observations of these authors have since been generally verified by HH. Loven and Bruzelius in the *Amphipoda*, and Lereboullet in the terrestrial *Isopoda*. We have also carefully dissected out most of the system in both the genera *Talitrus* among the *Amphipoda*, and *Ligia* among the *Isopoda*. The plan of the nervous

system in these two orders is that of a typical crustacean. A ganglion corresponds to every segment of the animal; those belonging to the organs purely of sensation being amalgamated together into a cephalic lobe. This is very beautifully shown by HH. Loven and Bruzelius (*Bidrag till Kännedomen om Amphipodernas inre byggnad* *).

Every ganglion of the several segments after the head is united to the others by two parallel cords in the *Amphipoda*, and one in the *Isopoda*, although in the genus *Ligia* we distinctly made out two, as in the *Amphipoda*: from each ganglion, on the right and left, is given off two main branches, and in *Ligia* we observed two other less important threads. These supply the legs and internal viscera. From the cords, about midway between each ganglion, branches off, on the external side of each, a single branch, which in the *Oniscidæ* M. Lereboullet places nearer to the preceding ganglion. In the *Amphipoda*, we found it rather nearer to the succeeding ganglion. In *Ligia*, it appears to be just midway between the two, from the base of which, both before and behind, spring other thread-like branches.

The diagrams of the arrangement of the caudal supply of nerves, given in the memoir of Lereboullet, differ from that given by M. Milne Edwards in his "Histoire des Crustacés." The latter author figures a distinct ganglion to each of the caudal segments, illustrating his view from observations on *Cymothoë*, in which the six segments are separate, while Lereboullet illustrates the caudal ganglia as being consolidated into a single mass, from which numerous threads are sent back to the extremity of the animal. Moreover, this author only figures six separate ganglia after the cephalic mass, which would make (even allowing the oral appendages to be supplied with small filaments of nerves, instead of branches springing from

* Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, Jan. 1859.

a well-developed ganglion), the seventh segment of the pereon to have its ganglion consolidated with those that supply the caudal region—a view that our own observations lead us to believe has been founded on a misconception.

GEOGRAPHICAL DISTRIBUTION.

The *Geographical Distribution* of the two orders of the Sessile-eyed Crustacea, if made under careful and extensive observations, would (from the great amount of the modification of parts, while a close assimilation of general form is very persistent throughout great numbers of genera) afford one of the most interesting and, we believe, instructive chapters in the distribution of life over the globe.

The subject has not yet sufficiently been worked out so as to approximate to correct information; for so much of the earth's surface has yet to be searched, that it is by no means improbable that new and intermediate forms may frequently be found in places that are yet unknown, so that forms that as yet are described as species or genera may be only modified forms of one species, or, as has been demonstrated by M. Hesse with respect to *Anceus* and *Pra-niza*, that animals placed by authors in separate genera and in distinct families may be only sexually distinct.

Such imperfect information as is at our command, while it does not enable us to grasp the subject so as to do justice to it as a whole, has yet enabled us to observe some points of interest that our British species possess in relation to exotic forms.

With the exception of a single specimen, brought from Algiers by M. Lucas, the genus *Talitrus* is only known as an inhabitant of the northern and western coasts of Europe, while its closely allied form, *Orchestia*, and its congeners, excepting *Nicea*, of which we know but one or two species (which tend to corroborate the assertion), appears to be

very abundantly scattered over the whole world. Like *Talitrus*, *Orchestia* lives out of the sea, choosing moist places, but not burrowing a habitat for itself as *Talitrus* does. With us, *Orchestia* lives within the reach of the spray of the sea; but some species in the Southern Hemisphere live many miles inland, choosing terrestrial plants for their abode, sometimes at an elevation of fifteen hundred feet above the level of the sea. In these specimens the males, and, we believe, the males only, have some one or other of the joints of one of the posterior pairs of legs developed into a large internally concave scale, which, we believe, assists in retaining moisture, so that the branchial sacs may not suffer from desiccation.

The genus *Montagua* appears to be wholly confined to the northern temperate latitudes, the species gradually diminishing in size as they approach the warmer seas. The close assimilation of this with *Stegocephalus* and *Pleustes* of the colder latitudes, is shown by the interchange of certain parts in their structure. In *Montagua*, the superior antennæ have no secondary appendage, neither have the mandibles a palpiform one, and the posterior pair of pleopoda terminate in a single ramus. *Pleustes* resembles *Montagua* in the former characteristics, but has the posterior pair of pleopoda terminating in two rami. *Stegocephalus* resembles *Pleustes* in its characteristics, but it has a rudimentary appendage on the superior antennæ. We have little doubt but that the others have also such an appendage in the larval condition, since it is a common feature in young *Amphipoda*. *Stenothoe*, in the Southern Hemisphere, represents the *Stegocephalidæ* in the Northern, and agrees with *Montagua* in all important characters; it differs in having a very large hand to the second pair of gnathopoda,—a doubtful generic character, in our estimation.

The genera of the sub-family *LYSIANASSINA* appear to be very generally diffused over the entire globe, increasing in dimensions in those species that approach nearer to the Arctic and Antarctic latitudes, in some instances reaching to the largest known of the order, equalling three inches in length, as may be seen in *Lysianassa Magellanica*, from the Straits of Magellan, and *L. gryllus*, from Spitzbergen. These two so closely resemble one another, that they cannot be characteristically distinguished.

The genus *Ampelisca*, and its near ally *Haploops*, we only know as belonging to the Northern Hemisphere, but in that region extending from Japan to Europe, from Greenland to North Carolina on the coast of America, and in Europe to the Mediterranean Sea.

In the sub-family *PHOXINA* all the genera but one are only known in the north temperate region, but with a widely diffused area, extending from Japan to Europe. One species of the genus *Ædiceros* has been taken in New Zealand, and one of *Iphimedia* in Terra del Fuego. Of the former we have our doubts in its relation to the genus; the latter has a very near resemblance to *I. Eblanae* of Europe. Most of the genera of this sub-family are burrowers in mud or sand. *Isæa* dwells, without being parasitic, on the back of hairy crabs, and the only specimens of *Darwinia*, that have been taken alive, were found adhering to the throat of a cod-fish. The genus *Sulcator* lives on sandy shores, making tracts along the margin of the sea, somewhat similar to those found in older slate and sandy rocks; and it may be interesting to remember that we have attributed to this sub-family the only *Amphipod* that has been hitherto discovered as fossil, the *Prosopeoniscus problematicus* of the magnesian limestone of Durham, and Zechstein-dolomite of Glücksbrun.

The family of GAMMARIDÆ belongs to the Arctic and north temperate zones. With but few exceptions of the closely allied congeners *Dexamine* and *Atylus*, which consist together of twenty-one species, we know of only one taken, near Valparaiso: all the rest are northern species. Of the genus *Aora* but two species are known; one from the British seas, the other from the western coast of South America (Valparaiso). Judging from the figures in Gay's "Hist. de Chile," the resemblance of the two species is remarkably close, an apparently useless tooth on the anterior margin of the first pair of legs of the southern form alone distinguishing it from the northern.

The subterranean fresh-water genus *Niphargus*, which lives generally in closed pump-wells in England and many parts of Europe, has its nearest congener in *Eriopus*, from the deep sea off Bohusia. Judging by the figure given by Bruzelius, there is little that distinguishes one genus from the other; and it is highly probable that *Gammarus pungens*, from the warm springs of Italy, is also a species of *Niphargus*. Of the two species of *Cran-gonyx*, another fresh-water subterranean genus, one is found in England, the other in Kamschatka, and these bear a very close resemblance to the female form of the marine *Gammarella*, a genus, though only having three species, found in the European seas, as well as on the South American coast and at Pitt's Island. Species of the genus *Melita* have been taken in European, Brazilian, and Indian seas, and *Mæra* extends all over the temperate zones of both Northern and Southern Hemispheres. The genus *Amathia* is essentially an Arctic form, the species losing their size and spinose character as they approach the temperate seas. No species has been recorded south of the English Channel, while a species found on the Crimean

shores of the Black Sea is as large and well developed as the Arctic specimens. From Pondicherry, also, a specimen is recorded that closely resembles the large specimens of the northern type.

The genus *Gammarus*, even as we have restricted it, contains between forty and fifty species, all of which are Arctic and north temperate, and extends round the globe, except one taken at Jamaica, another at New Holland. Fresh-water species of the genus inhabit the rivers and streams of Europe and North America. *Megamæra*, a near congener of *Gammarus*, has the largest and most spinose species in the northern regions, while others are found at Peru, Borneo, and the Zooloo seas.

The genus *Amphitoë* contains between thirty and forty species, and is very universally spread over the globe, species having been taken in the Arctic seas and all round the coast of Europe, in the Black Sea, and the Mediterranean; they have been found at the Cape of Good Hope, and on the eastern and western coasts of South America, on the Australian shores, as well as in Zooloo and Japanese seas, in the islands of the Pacific and Atlantic Oceans, also on the weed in the Saragossa Sea, of the Atlantic, and on floating plants in the Pacific; and one species is recorded from the fresh-water marshes of South Carolina.

Podocerus is mostly northern, extending, however, down the coasts of Europe and America. One species is recorded by Dana from the Bay of Sunda, and another from the shores of Brazil.

Cerapus, including its female, *Leucothoë*, has a wide range, species having been taken on the European and North American shores, on the eastern coast of South America, and in the Indian and Zooloo seas, while its near ally, *Siphonæctus*, has only been found on the north-

western shores of Europe. The genus *Nænia*, all the species of which are closely allied in form, has only been recorded from the British shores. Four species of *Cyrtophium* have been discovered, one of which is from the East Indies, one from Rio Janeiro, and two from the north-west of Europe. *Corophium*, so abundant when found, has been taken on the western shores of Europe, the Mediterranean, on the coasts of Japan and Brazil. It burrows in mud; but there is reason to doubt either that it preys on the Annelids or migrates at particular seasons.

That terrible wood-destroyer, *Chelura*, so devastating to the piles and submarine timber all round the shores of Europe, has not been recorded from other lands.

We have generally looked upon the *Hyperina* as pelagic species; but recently it has been pointed out by Mr. Edward, that some of our British genera burrow into and hide themselves in sand on the shores of the Moray Firth. The two British species of *Hyperia* (which we have great reason to believe to be but one, being male and female), have an extensive geographical range, from Greenland to Cape Horn, from Rio to the Zooloo seas.

Vibilia has apparently an equally extensive range, though fewer species have been determined. *Themisto*, also, has been recorded from Greenland to sixty-three degrees south latitude in the Atlantic Ocean, while species of *Phronima* have been taken as far north as the Shetlands, as well as in the Atlantic, at Naples, and at Borneo. The *Caprellidæ* appear to be very universally and abundantly diffused. The very close resemblance of the species from very distant and opposite localities is suggestive of a close affinity in the respective forms. Specimens from Japan, and the eastern coast of North America, are not appreciably distinct from others found on the eastern coast of South America, as well as on our English coast; and when we take into consideration the

changes in the forms that the animals of this genus undergo in their growth to an adult state, it is not improbable that immature specimens may be misinterpreted for adult varieties. *Cyamus* lives parasitically on the whale, and probably thrives on no other animal. The one or two solitary specimens that have been found attached to the dolphin are probably young creatures that have strayed from their natural habitat.

The genera of *Isopoda* appear to be more generally diffused throughout the various regions of the sea; and from the various distant localities in which that species have been found, some may be inclined to think that they are universally distributed.

The genus *Tanaïs* has been found on the coasts of North-Western Europe, Brazil, in the Zooloo and Feejee seas, as well as on the western coast of North America; and equally varied have been the recorded habitats of the nearly allied genera, *Paratanaïs* and *Leptochelia*, which latter Fritz Müller believes to be the male of *Tanaïs*. The near ally, *Apseudes*, is only known in Europe and Egypt, where but few specimens of two closely resembling species have been found. The genera *Anthura* and *Paranthura* are also sparsely represented, both in the species and specimens. They have been taken on the southern and western coasts of Europe, at New Zealand, the Mauritius, and the Cape of Good Hope, as well as on the eastern coast of North America. Of the genus *Anceus*, of which eleven species have been determined on the north-west coast of France, by M. Hesse, three at most are known to the rest of Europe, and but a single species to the eastern coast of North America.

The *Bopyridæ* are tolerably abundant in the temperate regions, but few in the more tropical or Arctic latitudes, the genera confining themselves with considerable exactitude to peculiar species of Crustacea. Thus we have failed

to detect *Cryptothiria*, which we have found to be tolerably abundant in the genus *Balanus*, in *Cthamalus*, whose habits and general appearance are so closely allied to it.

The several genera of the family *Ægidae* are animals peculiarly belonging to the temperate seas, and adequately represent the *Cymothoidæ* of the torrid zone. It is remarkable that, being parasitic upon fishes, no species of the latter family has been hitherto detected on our own coasts.

The *Asellidæ* flourish chiefly in the temperate regions of the seas, being scarcely represented in the frigid zones, and not at all in the torrid.

Arcturus is peculiarly an *Isopod* of the colder zones, where its species grow to the greatest dimensions in both the northern and southern seas; but a single specimen has been taken in the torrid zone, in thirty-one fathoms of water, north of Borneo. The *Idoteidæ* flourish everywhere, the largest specimens being in the Baltic Sea and near Cape Horn. They live amongst the weed, either fixed or floating, and species have been often taken swimming free in mid-ocean, where they assume, as Crustacea under the same condition frequently do, a deep indigo-blue colour. The *Spheromidæ* are a family that are very littoral in their habits; they range from the equatorial latitudes to the colder regions of the temperate zones, but die out before reaching the Arctic and Antarctic isothermal lines. In hotter latitudes, some species, in their depredations on submarine timber, take the place of *Limnoria*, a genus of the *Asellidæ*, and surpass it in the extent of their capability of injuring submerged wood.

Ligia, and the other terrestrial genera, appear to find their home best in the temperate latitudes, but live from the equator to within a short distance of the frigid climate.

These few observations, imperfect as they naturally

must be, demonstrate, we think, the great amount of interesting information that a more complete study of the subject must elucidate. (C. S. B.)

As the information conveyed in the following letter reached us too late to appear in the Appendix, we think it but just to the author to publish it entire; the more so since, during the progress of his researches, we repeated them and know their accuracy.

MY DEAR SPENCE BATE,

You are kind enough to ask me for a short abstract of my investigations in the anatomy of Anceidæ which I tried to make when staying with you in Plymouth. I am the more glad to follow your request, since it is especially your Memoir upon these animals that made me desirous to work on them. You were quite right in directing the attention of observers to the internal structure of these little Crustacea, for there are some points in their organization which were not followed up by Mr. Hesse in his elaborate Memoir, and some points in which, your opinion differing from that of the French naturalist, we had no certainty about their real nature.

I do not think that you are right in speaking of an early distinction between the male and female Anceus. There is no doubt that the outward aspect of some of the little Pranizæ, just having left the parent, makes more the impression that they are to become Anceus, whilst others resemble more the female, or Praniza form. But in giving special attention to that point, I found that this impression was only due to the expansion of the segments of the pereion being greater or smaller than to any real difference. Besides that, I kept some animals, which had rather the aspect of females than males, during some time in a glass, and had the opportunity of watching their moult. Two of them enabled me to see the large projecting mandibles of the males within the head of what I thought was a female. I examined immediately the sexual parts of the specimen, and found a well-developed penis on the last exceedingly small segment of the pereion. There can be no doubt, therefore, that Praniza changes into Anceus.*

This is what Mr. Hesse contended. But though I must agree with him in this, I cannot but have another interpretation regarding the so-called larval or Praniza state. Mr. Hesse says, that only the Anceus state is the adult state, and that, "quelques jours avant la transformation des Pranizes femelles en Ancées les œufs qui préexistent s'aperçoivent à travers la peau," &c. In calling the eggs pre-existent, he is not, it appears to me, justified, for they make their appearance very soon, and begin their development in animals which are far from the Anceus period, which Mr. Hesse calls their Anceus state. I agree, on the contrary, fully with you in calling the adult or Anceus state one of a retrograde character, for every organ begins then to degenerate.

Regarding the digestive apparatus, my investigations have led me to other results than your remarks seem to show. I could observe the mouth and the whole intestine in the old males as well as females. Those sacs, filled with green mass, are the liver sacs, as the study of their embryology clearly states. The embryology clearly indicates the Isopodous nature of the family; but I must say that I never found, nor expected to find, such forms as Mr. Hesse figures with a central red eye. There certainly must be an error in his drawings.

There is another puzzling circumstance regarding the conformation of the segments. In the adult there seems to be the want of one of the typical segments, and you consider it to be either the first or second segment of the pereion. But my embryological investigations show that all the typical segments are present, as in other Isopoda. In the very early state of the embryo you will find two pairs of antennæ, one pair of mandibles, two pairs of maxillæ, and seven pairs of feet. Every one of these extremities corresponds with a segmental division of the body. But there is between the last pair of the pereiopoda and the first pair of pleopoda a segment whose extremities are wanting. This segment afterwards constitutes a very small portion of the pereion, and is rather easy to be overlooked; in the male the penis is fastened to it. Counting that segment, you will find there is none wanting in the composition of the body; and you can be quite sure in calling the first pair of the legs of the embryo the maxilliped, and the second the gnathopod, for both are connected with the mouth in a very early state already.

I could add some more particulars about the internal structure of the animal, but it would hardly be of much use without adding plates to what I have to say. What I have already stated will, however, show, that though there are some anomalies about the Anceidæ, they are not of such extent as formerly was believed. I hope, besides, to give a complete account of my investigations in a short time in one of our German periodicals.

Messina, October, 1868.

Yours &c.,

ANTON DOHRN.

* It must not be forgotten, with reference to this too general expression, that it is only the male individuals (having in the young state the form of Praniza) which are transformed into the Anceus state; the females retaining their preceding form of Praniza. I. O. W.

BRITISH SESSILE-EYED CRUSTACEA.

Order AMPHIPODA.*

THIS name was given by Latreille to the present order † of Crustacea on account of the animals contained in it having both swimming and walking legs, and to distinguish it from the order Isopoda, in which the legs are adapted for walking only.

The Amphipods exhibit the characters of the great class of which they are a part, more typically perhaps than any other Crustacea. In the higher orders, the head, from its great development, encroaches upon the body, and in the lower orders, the body encroaches upon the head. The type ‡ of a class, order, or indeed any other group, is to be found in its centre, and not at either extremity of the series.

The Amphipoda are formed upon the Macroural type, from the normal condition of which they differ in the three following important particulars: first, there is no

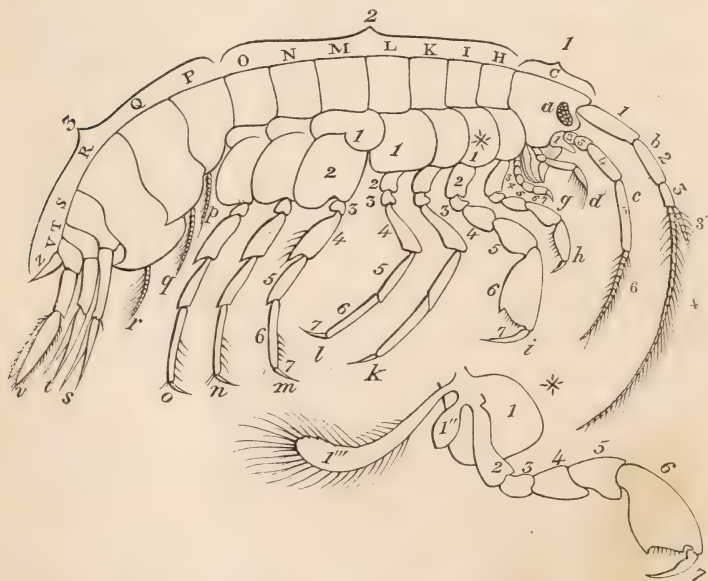
* Derived from the Greek *αμφω*, both; *ποδες*, feet.

† It must be borne in mind that, for the considerations set forth in the Introduction, the order Laemodipoda, proposed by Latreille for Caprella and its allies, has been rejected—that group being regarded as an aberrant division of the Amphipoda.

‡ The following definition of a type is given by Professor Whewell, as the 92nd aphorism concerning ideas, in his “Philosophy of the Inductive Sciences:”—“Natural groups are best described, not by any definition which marks their boundaries, but by a type which marks their centre. The type of any natural group is an example which possesses, in a marked degree, all the leading characters of the class.”

carapace covering the upper portion of the segments of the body, consequently these segments are themselves made dorsally perfect; second, the gnathopoda, which, in the *Macroura*, constitute the two outer pairs of mouth-organs, become prehensile instruments, increasing the number of legs to seven pairs; and, third, the tail, or caudal apparatus, consists of four segments instead of two.

In the *Amphipoda*, on the other hand, the various segments are nearly equally developed throughout, whilst, from being generally compressed at the sides, or cylindrical in form, the animals of this order are easily distinguished from the *Isopods*, which are, for the most part, broad and flattened in shape.*



* Hence, to a certain degree, the *Amphipoda* constitute a group parallel in their own division with the *Macroura* amongst the *Decapoda*, whilst the *Isopoda* form an analogous group to the broad and flattened *Brachyura*, the *Caprellæ* offering a kind of parallelism with *Squilla* and its allies.

TABLE of the External Organs of the Amphipoda, with the Letters respectively attached to each, as employed throughout the engravings in this work.

C	Cephalon	Head.
H to O	Pereion	Body.
P to Z	Pleon	Tail.
(C)	a Eyes	Eye.
b	Superior antennæ: 1, first; 2, second; 3, third joint of peduncle; 3'', secondary appendage; 4, flagellum.	Superior antennæ: 1, first; 2, second; 3, third joint of peduncle; 3'', secondary appendage; 4, flagellum.
c	Inferior antennæ: 1, first; 2, second; 3, third; 4, fourth; 5, fifth joint of peduncle; 6, flagellum.	Inferior antennæ: 1, first; 2, second; 3, third; 4, fourth; 5, fifth joint of peduncle; 6, flagellum.
d	Mandible; d'' mandibular appendage.	d Mandible or jaw; d'' mandibular appendage or palpus.
e	First maxilla, or first siagonopodos *	e First maxilla.
f	Second maxilla, or second siagonopodos	f Second maxilla.
g	Maxillipede, or third siagonopodos	g Foot-jaw or pedipalp.
(H to O) h	1st Gnathopodos, representing the 2nd maxillipede, or fourth siagonopodos.	h 1st } i 2nd } legs.
i	2nd Gnathopodos, representing the 3rd maxillipede, or fifth siagonopodos	
k	1st Pereiopodos	k 3rd
l	2nd do.	l 4th
m	3rd do.	m 5th
n	4th do.	n 6th
o	5th do.	o 7th
(P to Z) p	1st Pleopodos	p 1st
q	2nd do.	q 2nd
r	3rd do.	r 3rd
s	4th do. or 1st Uropodos	s 1st
t	5th do. 2nd do.	t 2nd
v	6th do. 3rd do.	v 3rd
z	Telson	z Terminal joint or middle tail-piece.

The corresponding joints of all the limbs are marked with the same number, and bear the same names throughout. We take one of the Gnathopoda as the type.

- | | | |
|---|---|--|
| 1 | Coxa | Coxa. |
| | 1'' Branchia | |
| | 1''' Plate of incubatory pouch | |
| 2 | Basos | Thigh. |
| 3 | Ischium | Knee. |
| 4 | Meros; 4'', inferior angle | Metacarpus; 4'', inferior angle. |
| 5 | Carpus; 5'', inferior angle | Wrist; 5'', inferior angle. |
| 6 | Propodos; 6', palma; 6'', inferior angle; 6''', inferior margin; 6''', superior margin. | Hand; 6', palm; 6'', inferior angle; 6''', inferior margin; 6''', superior margin. |
| 7 | Dactylos; 7'', Unguis | Finger; 7'', Nail. |

* This name is here suggested as the Greek equivalent for the Latin name of the five pairs of appendages succeeding the mandibles, which were collectively termed *pates-mâchoires* by Cuvier, Savigny, &c. The *levres supérieure* and *inférieure* of these authors are omitted for the reasons assigned in the following page.—(I. O. W.)

The animal is naturally divided into three parts: the head (or cephalon, c), formed of a single segment; * the body (or pereion), consisting of seven segments (h to o); and the tail (or pleon), formed of six segments (p to v), exclusive of the terminal scale (or telson, z). These divisions are distinctly visible, and never encroach upon each other; while the appendages assume characteristic forms in each division. Those which belong to the head are more or less connected with the organs of sense.

The eyes (*a*) are sessile and compound. Their normal position is between the bases of the superior and inferior antennæ. In the Orchestiidae and near allies they are on the top of the head, to which position they are thrust by the great increase of the size of the two basal articulations of the antennæ and their absorption into the anterior portion of the head. The outer integument of the eyes is never divided into facets, except in some genera of the Hyperina. In many of the Phoxides the eyes appear to be wanting; but this is probably caused by the absence of any colouring pigment, or its dispersion after death, rather than from the absence of the organ of vision. In *Ampelisca* they appear like four simple organs, resembling the ocelli of true insects.

The anterior or superior pair of antennæ (*b*) are formed

* Adopting the theory of Oken, that each pair of limbs or organs indicates a separate segment (often, indeed, coalescing with the adjacent one), the head would consist of nine segments, namely:—1st, that supporting the eye; 2nd, the upper antennæ; 3rd, the lower antennæ; 4th, the upper lip, formed of two lateral halves united; 5th, the mandibles, or jaws; 6th, the lower lip, formed like the upper lip; 7th, the first pair of maxillæ; 8th, the second pair of maxillæ; and 9th, the foot-jaws. If to these are added the seven segments of the body, the six segments of the tail, and the segment represented by the terminal scale, we have twenty-three segments as the normal number in the *Amphipoda*. As, however, Mr. Spence Bate regards the two lips merely as the calcified extremities of the alimentary canal, the number of head-segments would be reduced to seven, and the entire number to twenty-one.—(I. O. W.)

of a peduncle consisting of three joints, and a terminal multiarticulate filament, supplied with auditory cilia. Occasionally there is a second appendage, generally rudimentary, but in some of the Phoxides it is of almost equal importance to the primary filament; the secondary appendage is, however, never furnished with auditory cilia.

The posterior or inferior pair of antennæ (*c*) consists of a peduncle of five joints and a multiarticulate filament. The first two joints are closely incorporated, and bear an olfactory denticle; but sometimes, as in *Talitrus*, the denticle is wanting, probably from the peculiarity of its condition of existence, as the Talitri do not live in water. Occasionally the terminal filament has the joints fused together. This numerical decrease is invariably attended with an increase of strength.

In some genera of the Hyperina both pairs of antennæ assume a rudimentary condition to such an extent that their respective parts cannot be readily defined: sometimes even one or both may be absent.

The jaws or mandibles (*d*) are placed between an anterior and posterior lip or labium; they consist of a pair of curved triangular blades, each furnished with a cutting edge and a grinding tubercle. Within the incisive margin there is frequently a second movable plate, formed upon the type of the preceding. Each mandible has very generally, though not universally, an articulated palpus or appendage. The anterior pair of maxillæ (*e*) consist of three or four foliaceous plates, whereas the second pair (*f*) have but two; they are extremely delicate, and furnished, upon their anterior margins, with plumose hairs, some of which are strengthened into spines of various shapes. Exceptions to the normal forms exist in the Hyperina.

The foot-jaws, or pedipalps (siagonopoda, I. O. W. or maxillipedes) (*g*), are the posterior pair of appendages

attached to the head; they have some of the joints foliaceous. They overlap the preceding appendages of the mouth, and act as a protecting operculum. In the Hyperina they are small, and do not overlap the whole of the buccal apparatus.

The two anterior pairs of legs (gnathopoda, *h* and *i*), which in the Podophthalmata are reduced in size, and employed as two additional pairs of foot-jaws or pedipalps, are here developed into arm-like legs, and are attached to the two anterior segments of the body. They are directed forwards, and generally formed upon the same type, the posterior being the larger; but to this general rule there are several exceptions. The sixth joint (or propodos, 6) is generally enlarged into a hand in both pairs, against the inferior margin of which the seventh joint (or dactylos, 7) doubles back, as a finger against the palm, and impinging against it, gives to the organ a prehensile capability. Sometimes the fifth joint (or carpus, 5), and also the fourth (or meros, 4), are inferiorly produced, so as to assist in prehension. These appendages seldom attain the form of the analogous chelæ in the higher orders; *Callisoma*, *Chelura*, and one or two others, being the few exceptions to this very general law. All the legs have the first joint* (or coxa, 1) developed into a large and squamiform plate, which covers a considerable portion of the second joint, and protects the branchial organs (figure *, 1'' and 1''' in p. 2), as well as the ova and embryos while confined within the incubatory pouch during the period of gestation. In the four

* By preceding writers, the series of scale-like plates at the sides of the body have been regarded as the homologues of the epimera of the thoracic segments of the Insecta. Mr. Spence Bate, however, considers them as the first joints of the legs, thus dilated for special purposes in the economy of the animals, an opinion which has been accepted by Professors Huxley, Kinahan, and others.—(I. O. W.) The reader will observe that we employ the term *joint* for a portion of a limb, and *articulation* for the connecting hinge.

anterior (*h, i, k, l*), and in some genera the fifth (*m*,) pairs of limbs, these plates are much larger than in the three or two posterior pairs; but to compensate for this diminution of size, the three posterior (*m, n, o*), with few generic exceptions, have the second joint produced posteriorly into a large and squamiform plate. In *Caprella* and the allied genera, the first joint of each leg is fused with the body of the animal, and is never shaped like scales.

The five posterior pairs of legs (pereiopoda, *k-o*) are the walking appendages; they homologize with the ten legs in the Decapoda, and as efficiently fulfil their design. Like them, they consist of seven joints; but, unlike them, all articulate in planes vertical to the body of the animal, having no lateral movements. The two anterior pairs of walking legs are directed forwards, and the three posterior are directed backwards. Thus the seven pairs of legs constitute three distinct series, generally differing from each other in their proportions, size, and direction, the first and second pairs being subcheliferous, the third and fourth porrected, and the fifth, sixth, and seventh pairs directed backwards.

The branchiæ (1'') consist of a series of vesicles; a single sac being attached to, and pendent from, the first joint of all the legs except the first, and in the males of some genera also the last.

The ova are nurtured within a pouch formed by a series of foliaceous plates (1'''), one of which is attached to the first joint of the four anterior pairs of legs in females. In this pouch the embryo continues until it has arrived at a period when there is but a slight distinction in form between it and the parent, except in the Hyperina, as has been shown by Milne-Edwards and Gosse, where the form of the young animal differs considerably from that of the parent.

Posterior to the legs used for walking, are three pairs

of flexible appendages (1st, 2nd, and 3rd pleopoda, *p*, *q*, *r*), consisting of a base and two multiarticulate filaments or rami fringed with plumose cilia. These are used in swimming, and, powerful for such a purpose, they propel the animal rapidly through the water. Succeeding to these are three pairs of appendages (4th, 5th, and 6th pleopoda, *s*, *t*, *v*; uropoda, I. O. W.), situated upon the inferior lateral margins of their respective segments. They consist of a single-jointed base, supporting two uniarticulate branches, inflexible and styliform, fringed with spines or hairs. The posterior pair vary considerably in form; in some genera they are furnished with hooks, whilst in others they assume a foliaceous character, circumstances which render them valuable in the recognition of species. These appendages are also powerful organs of propulsion. By folding the tail beneath the body, and suddenly striking it out again, those animals which exist in the water, as well as those which live on the shore, are enabled to dart or leap to a considerable distance. In *Caprella* and its near allies, the whole of the appendages of the tail are absent, or present only in a rudimentary and altered condition.

The terminal segment of the animal (telson, *z*) is represented by an imperfect or rudimentary appendage or scale. From the great variety of shapes which this appendage assumes, it becomes a valuable aid in the determination of genera. The typical form may be considered to be that of an acute-angled triangular scale, the apex being rounded off. Sometimes it is divided into two, as in *Gammarus*; again, it is deeply cleft; in one genus it is represented by a hook only; in some, it is broad, flat, and foliaceous, in others it is cylindrical, the intestinal canal terminating at its extremity.

Compared with the podophthalmatous Crustaceans, the animals forming the present order are of small size, the

great majority being less than an inch long, and none exceeding thrice that length. Like all the productions of nature of diminished size, the number of individuals of different species far exceeds that of the larger-sized Crustacea. With few exceptions, there is but little external difference of form between the opposite sexes; the males, however, contrary to the ordinary rule in the Annulosa, being often larger than the females. There is also but little difference in form between the young and adult individuals of the several species, except where marked characters exist, such as the enlarged form of the hands, or spines on the different segments of the body, which increase in size as the animals become older. The species occur in temperate or high latitudes in greater proportion than in tropical climates.

Thus it will be perceived that among the Amphipoda there is a considerable variety of form, some keeping closer to the typical idea of the Order, while others vary more or less considerably. It is therefore desirable, both for clearness of expression and in order to obtain a better knowledge of the whole, that we should arrange together those which more nearly assimilate to each other; whereas others, which vary in a greater or less degree, should be grouped according to their respective details.

In the works of Leach, Latreille, Milne-Edwards, Kröyer, Dana, Zaddach, Liljeborg, and Bruzelius, various modes of classification of these animals have been proposed. Based upon a consideration of these various arrangements, as well as upon the structure and respective habits of the different animals (resulting from a considerable observation of their economy and modes of life), and having had the advantage of studying the types of Montagu, Leach, Phipps, M.-Edwards, and others, we have drawn up the following tabular distribution of the Order :—

Group—NORMALIA.

This group comprises the typical Amphipoda, and includes the whole of the order except those forms which have some of the appendages absent, or have the first joint of the legs absorbed into the body of the animal. It is synonymous with the order of Amphipoda of Latreille, Milne-Edwards, &c., and is separated into two divisions—namely, GAMMARINA and HYPERINA.

Division—GAMMARINA.

Distinguished from the other division of the group by the smallness of the eyes, the normal form of the antennæ, the size of the foot-jaws, and the largeness of the squamiform plates of the legs. This division corresponds with Milne-Edwards's family of Crevettines, and also with that of Gammaridea of Dana. It is subdivided into VAGANTIA and DOMICOLA.

Subdivision—VAGANTIA.

The VAGANTIA have always the inferior antennæ terminating in a flexible multiarticulate flagellum, and the posterior pair of caudal appendages are fringed with fine hairs or short spines, and are never furnished with hooks. They construct no abodes to dwell in, but wander from place to place, swimming or walking in the sea, and hopping or wriggling along upon their sides on land.

This subdivision represents Milne-Edwards's tribe of Sauteurs. It consists of the two tribes SALTATORIA and NATATORIA, each consisting of a single family.

Tribe—SALTATORIA.

In this tribe the posterior caudal appendages are never longer than the two preceding pairs. The hairs upon the



animal are short and stiff. The mode of progression, when out of the water, is by leaps. The animals are generally terrestrial or subaquatic. This tribe contains but a single family.

Fam.—ORCHESTIIDÆ.

The superior antennæ are never longer than the inferior, and never furnished with a secondary appendage. The mandibles are without a palpiform appendage. The squamiform joints of the legs are largely developed. The caudal appendages are very short and stout, and the posterior pair only possess a single branch.

The following vignette represents the Hoe Gate, Plymouth, the house in which Dr. Leach was born.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.

Genus—TALITRUS, LATREILLE.

Generic character. Superior antennæ short and rudimentary. Inferior antennæ with the basal joints fused into the facial wall of the cephalon. Mandibular palpi obsolete. Maxillipedes not unguiculate. First pair of gnathopoda simple; second pair small and feeble. Coxæ of third pair of pereiopoda as deep as the coxæ of the second, and divided into two equal lobes. Telson rudimentary.*

THE eyes are near the top of the head. The superior antennæ are very short, not reaching to the extremity of the second free joint of the inferior. Inferior antennæ with the two basal joints absorbed into the frontal wall of the head. Fingers of the foot-jaws not unguiculate. First pair of legs not having a subchelate hand in either sex: second pair of legs smaller than the first pair, and imperfectly subchelate in both sexes. Coxæ of the fifth pair of legs subequally bilobed, and nearly as deep as the coxæ of the preceding pair. Middle scale of the tail rudimentary or single.

The genus *Talitrus* was first proposed by Latreille in his "Précis" (1796), under the name of *Gammarus*, for the reception of the Amphipoda with short upper antennæ; the remainder, with longer upper antennæ, being arranged in his genus *Carcinus*. The name *Talitrus* itself

* The structural terms employed in the short generic and specific characters of the *Amphipoda* are those proposed by Mr. Spence Bate in his "Report on the British Edriophthalma," published in the Reports of the British Association for 1855. In the text the ordinary English names of the various parts are adopted, as given in the Table of External Organs in page 3.

first appears in the year 1802, both in the third volume of Latreille's "Histoire générale des Crustacés et Insectes," and in the second volume of Bosc's "Hist. nat. des Crustacés," the latter writer giving Latreille the credit of the invention: This must be borne in mind, because Latreille, in his "Genera Crust. et Ins.," vol. i., 1806, refers the genus *Talitrus* to Bosc as its author. In the last-mentioned work we find the genus, according to the views of its founder, to be as extensive as our family Orchestiidæ (which it would consequently have been more correct to have named, after the present genus, Talitridæ), embracing the whole of the saltatorial species. Subsequently Leach separated the species with the first pair of legs cheliferous under the name of *Orchestia*. In this he has been followed by all subsequent writers. Milne-Edwards, Dana, Desmarest, and others, however, introduced into this genus those species which have the second pair of hands as large as in the males of *Orchestia*; but Nicolet* has very justly separated them from *Talitrus*, under the generic name of *Orchestoidea*. Brandt† has likewise done the same, but, without being aware of what Nicolet had proposed, has given to the same genus the name of *Megalorchestia*, which Stimpson has followed. Accepting this latter separation of the species into two genera, *Talitrus* appears to be peculiar to the European coasts and the southern shores of the Mediterranean. The species *T. brevicornis* of Edwards and *T. Novi-Zelandiæ* of Dana, both from New Zealand, have only been described from females, and since the female specimens belonging to the genus *Orchestoidea* resemble Talitri, it is not improbable that these may likewise be the females of *Orchestoidea*.

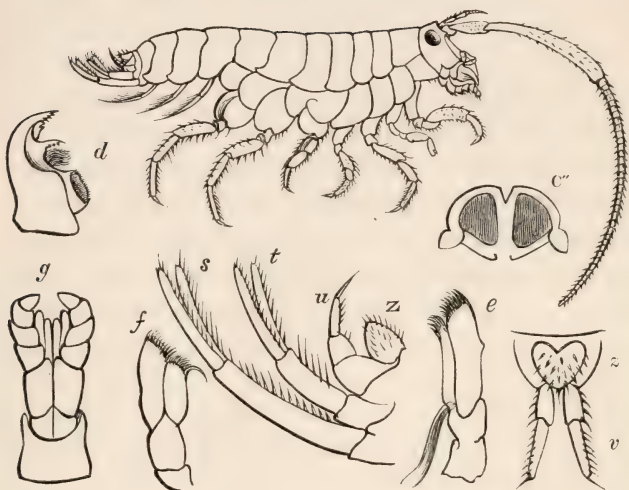
* In Gay's "Hist. phys. de Chile," iii. p. 229. Crust. pl. 2. fig. 4.

† Bull. Acad. St. Pétersbourg, 1851, ix., pp. 133, 310.

There can be little doubt that, under the name *Cancer locusta*, the great Swede grouped more than one species. Hence the difficulty of determining the specific name entitled to priority of publication—(if this difficulty exists with Linnæus, how much greater it must be with earlier writers!)—a circumstance which accounts for the discrepancies of opinion among later authors, some attributing the name to a species of *Gammarus*, and others to one of *Talitrus*. For our part we think that Linnæus included species of both genera, but certainly *Talitrus* was one; he says that it is entirely of a blue colour, that the hands of the two fore pairs of legs are adactyle, and hence that there are seven pairs of slender feet, and that he had seen it “ad montem Thorsburg, in mari juxta Gotlandiam.” On the other hand, he refers to Roesel’s figure of the fresh-water *Gammarus*, and adds that the tail is trifoliated, “intermedio subulato.” His disciple Fabricius has added to the confusion by giving the Linnæan character of the legs, but adding that the tail was furnished with bifid spines, with the locality “in Europæ maritimis frequentissimus dorso innatans, etiam sæpe in fontibus et fossis stagnantibus:” thus comprising at least three species with different habits. Under these circumstances, and in order to avoid the confusion arising from the same specific name having been also applied to the common shore species of *Gammarus*, it might have been correct to have retained for the species of *Talitrus* the name of *Saltatrix*, given to it by Klein, and adopted by Montagu and Milne-Edwards; but since Turton, in his translation of the “*Systema Naturæ*,” as early as 1806, used the specific name which most English authors have employed, we consider that we are justified in continuing it.

AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.



TALITRUS LOCUSTA, Linnæus?

(*The Sand-Hopper.*)

Specific character. Superior antennæ only reaching to half the length of the penultimate joint of the peduncle of the lower. Last joint of the peduncle of the inferior antennæ nearly twice as long as the penultimate. First pair of gnathopoda robust and powerful. Second pair of gnathopoda feeble, membranaceous, terminating in an imperfectly-formed sub-chelate hand; dactylos small and remote from the extremity of the propodos. Posterior pair of pleopoda very short. Telson rudimentary.

Length, half to three quarters of an inch.

Cancer Locusta,

LINNÆUS, Fauna Suec. No. 2042? * Syst. Nat.
ii. 1055, and Edit. TURTON, vol. iii. p. 760
(1806).

* The descriptions of the species of *Amphipoda* given by the earlier carcinologists are by no means sufficiently precise to allow satisfactory identifica-

- Squilla saltatrix*, KLEIN, Crust. p. 68, f. D.E.F.
- Cancer (Gammarus) saltator*, MONTAGU, Linn. Trans. ix. p. 94. t. 4, f. 3 (male).
- Talitrus Locusta*, LATREILLE, Hist. Nat. Crust. et Ins. vi. 229.
 LEACH, Linn. Trans. xi. 356. PENNANT, Brit. Zool. iv. p. 21. PALLAS, Spic. Zool. fasc. 9, t. 4, f. 7. LEACH, Edin. Encycl. Crustaceology, vol. vii. p. 432. DESMAREST, Cons. p. 260, t. 45, f. 2. RISSO, Hist. Nat. de l'Europe Meridion. vol. v. p. 98. GUERIN, Exped. Scien. de Moree, iii. p. 5, sect. 2, p. 44. Zool. pl. 27, f. 4, e. BREBISSON, Cat. des Crust. du Calvados, 1825, p. 250. BOUCHARD CHANTEREAUX, Crust. Boulonnais, p. 128. WHITE, Cat. Crust. Brit. Mus. 1847, Popular Hist. Brit. Crustacea, p. 160; Cat. Brit. Crust. Brit. Mus. p. 48. GOSSE, Mar. Zool. vol. i. p. 142. SPENCE BATE, Ann. Nat. Hist. 2nd ser. vol. xix. p. 135; 1857, Cat. Amph. Brit. Mus. p. 5, pl. 1, f. 1.
- Talitrus Saltator*, MILNE-EDWARDS, Ann. Sc. Nat. xx. 364, Hist. des Crust. iii. p. 13. CUVIER, Règne An. (Ed. CROCHARD), t. 59, f. 2. LUCAS, Exped. dans l'Algérie. ZADDACH, Syn. Crust. Pruss. p. 4. TEMPLETON, Loudon Mag. Nat. Hist. vol. ix. p. 12.
- (Female) *Talitrus littoralis*, LEACH, Edin. Encyclop. vol. vii. p. 402, Art. Crustaceology.

THE general appearance of the animal is strong and powerful, and but slightly compressed laterally. The tail is very short, and generally lies folded beneath the body; from which position, when forcibly struck out, it enables the animal to spring to a considerable distance. Hence it derives its English name of "hopper," and its French cognomen of "Puce de mer." Its generic name, *Talitrus*, signifies a "fillip." The male is larger and more robustly formed than the female.

tion, and unfortunately, in respect to the Linnæan species, the Linnæan cabinet affords us no help, as it does not contain any of his typical specimens.

The eyes are large, irregularly round, and placed near the top of the head. The upper antennæ are so small that they seem almost rudimentary. The lower antennæ in the male are long, sometimes two-thirds the length of the animal; in the females and young males they are much shorter. The peduncle is longer than the flagellum, and appears to consist of but three articulations, the two basal ones being fused into the frontal wall of the head, a circumstance which forces the superior antennæ and organs of vision nearly to the top of the head, a position not common in the Amphipoda. The olfactory denticle is wanting. The organ of smell probably undergoes some change to meet the altered condition of the existence of the animal from that of marine crustacea generally.

The mandibles are powerful organs, armed at the biting edge with teeth, formed more for tearing than for cutting; below which a second row of denticles is fixed upon a plate, which is movable. A few strong hairs or spines, curved inwardly, are situated between the incisive margin and the molar or grinding tubercle. This last is a prominence at the inner base of each mandible, and is crowned by very minute denticles, and corresponds with a similar grinder in the opposite jaw. By the joint action of these two molar tubercles an imperfect mastication is effected.

The foot-jaws are not unguiculate—that is, the last articulation does not terminate in a sharp, nail-like extremity, but ends obtusely, the tip being fringed with short hairs. A squamiform plate is developed from three of the articulations, of which the first, the most internal, is the largest, and is furnished at the extremity with three small stout spines or teeth. The apparatus which composes the mouth projects anteriorly beyond the head, by which means the animal can the more easily gather its

food from fixed positions—a circumstance, according to Leach, from which it has earned the specific name of *Locusta*.

The first pair of legs are simple, the terminal joint being slightly curved, but not having the power to impinge against the preceding. They are strong and efficient for the purpose of burrowing or hooking to any substance, but have no prehensile capability.

The second pair of legs are feeble, of a membranous appearance, and generally lie folded up close beneath the body. The terminal joint is short, almost obsolete, and placed at a considerable distance from the extremity of the preceding, appearing to be an inefficient organ.*

The two next succeeding pairs of legs are strong and efficient members for perambulation, but they are not so powerful as the last three pairs.

The first or scale-like joint affixed to the sides of the body, is largely developed in each leg. That of the fifth pair of legs is bilobed, and is anteriorly nearly as deep as the one that precedes it.

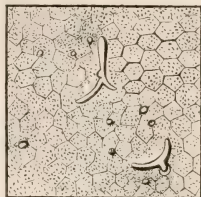
The swimming fins are short, being never required, since the animal never voluntarily seeks the sea. The lateral appendages of the tail are short and stout. These, with all the other limbs except the second pair of hands, are furnished with fasciculi of short, spine-like hairs. These hairs are generally blunt at the tip, and furnished laterally with a slight secondary appendage, about one-

* In Milne-Edwards' figure of the male of *T. saltator*, stated to have been copied from the living specimen (R. An. Ed. Crochard, Crust., pl. 59, fig. 2a), the second pair of legs is represented as evidently larger than the first pair, but destitute of spines. This figure, therefore, appears to us rather to represent *Talitrus Beaucoudraii* of M. Edwards.

It must be borne in mind that, throughout the Amphipodous portion of this work, the limbs on one side of the body are alone represented, in order to prevent confusion; the opposite limbs being identical in structure.



third from the apex. The structure of the hair towards the point is obscurely spiral. Those upon the tail are often considerably worn down by the friction induced by leaping. The central tail-piece is represented in this species by two small calcareous nodules.* The



surface of the body is highly polished. An examination of the structure of the integument by the aid of the microscope shows traces of the original cell-character of the tissue and the granular arrangement of the salts within the cells. There are, moreover, certain larger markings that assume somewhat the form of the letter τ. But we are not able to recognize them as associated with any peculiar function.

The female exhibits the character of the species less strikingly than the male, being considerably smaller, and having the antennæ shorter. So great indeed is the difference, that Leach, in the "Edinburgh Encyclopædia," inserted it as a distinct species, under the name of *Talitrus littoralis*, an opinion which he afterwards corrected in the "Linnæan Transactions," vol. xi.

The Sand-hoppers dwell near the margin of the sea, where the highest spring-tides rise. They are never found in the water, but dwell beneath the decaying seaweed, or other stray substances which preclude the evaporation of moisture from the scorched sandy beach. Mr. Gosse tells us that he has found them at the depth of several inches in half-rotten beds of algæ, where the fer-

* Our figures in page 16 were taken from very large males, captured at Weymouth, by Professor Bell. In these individuals the central tail-piece is heart-shaped and spined (fig. 2), and the upper antennæ extend to the tip of the penultimate joint of the peduncle of the lower, of which latter the relative proportions of the joints were carefully measured for delineation.—(W.)

mentation has induced a heat so great that he could scarcely bear his hand.

When the summer is hot, and no moisture exists beneath the decomposing seaweed, they burrow into the sand two or three inches deep, until they find moisture enough to suit their comfort; whence they come out to feed upon any carrion left by the retiring tide. Offal, which would otherwise decompose and infect the air, is thus by their assistance often rapidly removed. They are not very dainty feeders. We have seen them enjoying their repast upon a common earth-worm; drowned puppies and other mammals, afford a luxury to thousands; and, when they can get nothing else, they are content to feed upon each other.

Mr. Adam White, in his excellent little manual, tells us that millions of these creatures were seen by Paley springing in the air so lightly that, at a little distance off, they marked the circuit of the shore as a line of mist. The religious mind of the observer saw in this shadowy wall the action of expressed gratitude for existence.

Upon the sands of Whitsand Bay, our friend Mr. Swain informs us that one day, at a picnic party, he saw "not millions, but cartloads," of this species lying piled together along the margin of the sea. They hopped and leaped about, devouring each other as if for very wantonness. A handkerchief, which a lady let fall amongst them, was soon reduced to a piece of open work by the minute jaws of these small creatures.

The numerical abundance of this species is kept within bounds by enemies more powerful than they can be to one another. The ring plover and other shore birds rapidly pick them up, and little beetles prey upon them, among which the *Cillenum laterale* and *Broscus cephalotes* have been observed.

It is in the summer months that they occur in such vast numbers. In the winter there is scarcely one to be seen; and when the frost is sharp, and the snow lies upon the ground, the Sand-hoppers appear to have retired into winter-quarters. This was first observed by Colonel Montagu. At this season we have noticed their general absence at Whitsand Bay, as has also our friend Mr. Barlee, at Exmouth. But Mr. Gosse informs us that they have been found at Weymouth, under the "half-rotten beds of algæ (chiefly *laminaria*)" all the winter.

When captured they feign death, and often keep up the deception for a considerable time. In this position, by the close packing of their scaly appendages, they are more secure from the attacks of beetles and other smaller enemies. Their colour when alive is a light fawn, marked down the centre of the back with black.

This species is one of the most perfect dwellers upon the land that we have among the European Amphipoda. They die if kept in water for any time, yet a certain amount of saline moisture appears necessary to lubricate the branchiæ. Though residing on land, they possess a purely aquatic character. In the southern hemisphere allied species have been taken many miles inland upon the stems of succulent plants.

This species is probably to be met with upon all the sandy shores of the temperate zone in southern and western Europe. In this country we have received it from the Moray Frith, in Scotland, where, the Rev. George Gordon says, it occurs in great abundance. Mr. W. Thompson and Professor Kinahan record it as common in Ireland. Specimens from Cultra, Belfast Bay, collected in May by Mrs. Patterson, and others from Newcastle, county Down, collected in the autumn, are preserved in the late W. Thompson's collection in

the Belfast Museum. We have noticed it on the southern shores of England and Wales. Milne-Edwards states that it is very common upon the north and west coasts of France. M. Guérin Méneville has received it from the shores of Greece ; Risso took it at Nice, and Lucas in Algeria. So that it will be important to record upon what sandy shores it is not to be found. It does not occur in Greenland, being omitted by Kroyer, nor does it appear in the work of Bruzelius on the Scandinavian species published at Lund in 1859.

The accompanying vignette of Whitsand Bay, near Plymouth, is from the talented pencil of our friend Mr. Philip Mitchell, of the New Water Colour Society.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.

Genus—ORCHESTIA, LEACH.

TALITRUS (part), LATREILLE.

Generic character.—General appearance of *Talitrus*, but having both pairs of gnathopoda subchelate. The second pair in the male large and powerful; in the female small and feeble. Telson single and well developed.

THE superior antennæ are as short as in *Talitrus*, and are often recurved. The inferior antennæ, as in that genus, have the two basal articulations incorporated into the anterior or frontal wall of the head, and destitute of the olfactory denticle. The mandibles are without an appendage,* and the whole of the organs of the mouth are largely developed. The two anterior pair of legs are furnished with prehensile hands, the first pair small, the second large and powerful in the male, but small and feeble in the female. The squamiform basal joint of the fifth pair of legs is subequally bilobed, the anterior lobe being as deep as the scale of the preceding legs. The posterior pair of caudal stylets consist only of a single branch. The tail-piece is single and well developed, entire, triangular, with the margin spinous.

This genus was founded by Leach to receive the *Cancer* (*Gammarus*) *littoreus* of Montagu. That Dr. Leach was

* A rudimentary palpiiform appendage in an Egyptian species of *Orchestia* is represented by Savigny near the base of the jaw (copied in our figure, p. 27, fig. d), but we have never seen it in any species.

well aware of the variation of the form of the legs in the opposite sexes of the type of the genus is fully evidenced by an original drawing now in the Hopeian collection at Oxford, containing highly-magnified figures of the fully-developed male, of a variety of the male with smaller second legs and undilated hind legs, and of the female with simple legs, the sexes being indicated, and the species named "*Orchestia littorea*," in Dr. Leach's peculiar handwriting. Liljeborg had also, in his account of the Crustacea collected by Dueben in Norway in 1844, noticed the sexual distinctions of *Orchestia littorea*, describing the female as exhibiting the typical form of *Talitrus*, and the male that of *Orchestia*, the female, in fact, closely resembling the *Talitrus tripudians* of Kroyer except in the length of the fourth and fifth pairs of legs, as compared with those of the second pair. The genus was previously confounded with *Talitrus*, and the female continued so until Fr. Müller pointed out the relative distinction of the second pair of hands, and their near resemblance to those of *Talitrus*.* Dana has more recently divided the genus, distinguishing those in which the female has the first pair of legs not developed into a subchelate or prehensile hand (in fact, a true *Talitrus*); while the male is a true *Orchestia*; that is, having the first pair of legs subchelate. This division, under the name of *Talorchestia*, together with those of *Talitrus* and *Orchestia*, he considers to be but subgenera of the genus *Orchestia*.

The genus *Orchestia* is perhaps the most cosmopolitan amongst the Crustacea, and may likewise be classed amongst the most terrestrial species of Amphipods. It has been taken from the north of Europe to Cape Horn, and

* Archiv. für Naturgeschichte, 1848, p. 53.

from New Zealand to the northern coasts of America. Yet with this vast geographical range we are not aware that a single species has been recorded within the tropics or arctic regions: although northern Egypt and the coast of Algiers are mentioned by Savigny and Lucas. Dana and Stimpson in America have not taken them in tropical latitudes.

Their common habitat is upon the sea-shore, out of the reach of the waves, but Dana has found them, and exotic species exist in the British Museum, which have been taken in shady woods some miles from the sea-coast, and Mr. Stimpson, the naturalist of the American Japanese expedition, informs us that he also has captured them in inland places.

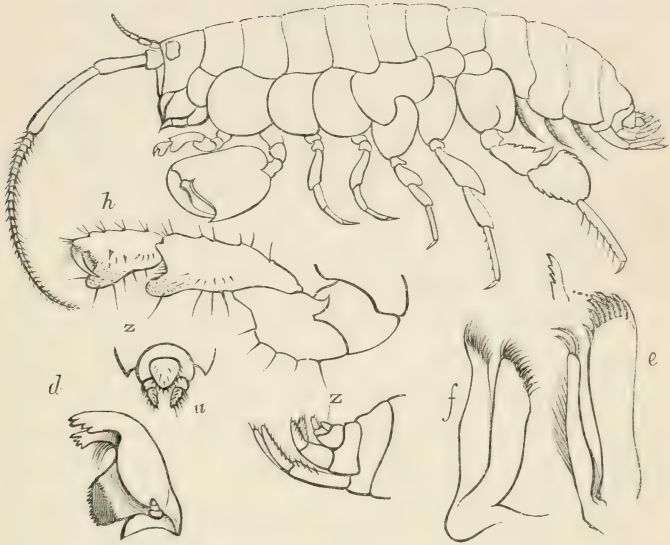
The *Orchestiæ* must be reckoned among our smaller shore-cleaners, feeding upon the offal left by the receding tide. Say has noticed of an American species, that when alarmed, the individuals will seize a portion of their food, and skip with it towards their holes in the sand, where they can devour it at leisure.

The accompanying vignette of figures, in the costume of the South of Wales, is by the promising pencil of our friend Mr. Sydney Whiteford.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.



ORCHESTIA LITTOREA.

(Shore-Hopper.)

Specific character.—Propodos of the second pair of gnathopoda having the palm convex, slightly oblique, with a small tooth at the inferior angle. Posterior pair of pereopoda, having the carpus and meros in the older males largely developed. Length $\frac{13}{20}$ of an inch.

- Cancer (Gammarus) littoreus*, MONTAGU, Linn. Trans. ix. p. 96, t. 4, f. 4.
Orchestia littorea, LEACH, Edinb. Encycl. vii. p. 402, pl. 21, f. 6; Linn. Trans. xi. p. 356; Encycl. Brit. Suppl. i. 424. DESMAREST, Cons. p. 261, t. 45, f. 3. SAMUELLE, Ent. Comp. p. 102. LATREILLE, Encycl. Méth. pl. 336, f. 1. WHITE, Cat. Brit. Crust. p. 48; Pop. Hist. Brit. Crust. p. 162, pl. x. f. 1. SPENCE BATE, in Ann. Nat. Hist. 2nd ser. vol. xix. p. 136; Cat. Brit. Mus. p. 27. GOSSE, Marine Zool. p. 142.

Pulex marinus,
Cancer gammarellus,

BASTER, Opusc. Subs. t. 3, f. 7, 8.
HERBST. ii. 129, t. 36, f. 2, 3.

THE eyes are black, irregularly round, moderately large, and situated near the top of the head. The superior antennæ are as short as in *Talitrus locusta*, reaching scarcely to the extremity of the penultimate articulation of the peduncle of the inferior pair. The inferior pair of antennæ in full-grown males are scarcely half as long as the animal, they have the first two joints fused into the frontal wall of the head; the last joint of the peduncle is longer than the preceding, and the articulated extremity is as long as the peduncle. The first pair of legs are small, with the penultimate joint shorter than the antepenultimate, and the inferior angle of each is developed into a scaly protuberance; the palm is short, convex, and edged with a row of single hairs: the terminal joint or finger is sharp, scarcely reaching to the extremity of the protuberance. The second pair of legs have the coxæ more largely developed, and almost covering those of the first pair: the penultimate joint is large and quadrate, being almost as broad as long: the palm is convex, and not furnished with any important spines or hairs, and armed at the inferior angle with a triangular tooth, which corresponds with the extremity of the finger. The third pair of legs are shorter than the two succeeding, which are subequal. The fourth and fifth joints of the last pair are broadly developed in the mature males, but in the females and young males they are not different from those of the preceding genus. The three posterior pairs of appendages are short and spinous, the posterior being very short. The middle tail-piece is single and pyriform.

The Shore-hopper is more compressed laterally than the

Sand-hopper. It is of a green colour, and hides beneath stones and vegetable refuse on the shore. The head is smaller than in *Talitrus*, and the inferior antennæ have the flagellum rather longer. The female bears a closer resemblance to *Talitrus* than the male. The second pair of legs are feeble, and very much like that of *Talitrus*, from which it can only be distinguished by the form of the hand of the first pair.

Orchestia littorea has generally been recorded as associated with *Talitrus locusta*, but our experience induces us to attribute the former to rocky, and the latter to sandy, shores. Probably, when there is an approximation in the character of the two kinds of coasts, the species composing the genera may be found to mingle. Montagu on the Devonshire coast, the Rev. George Gordon in the Moray Frith, and Professor Kinahan, at Kilkenny, report the two genera as being found together. But in the long sandy beach in Swansea Bay we never took an *Orchestia*, though they are to be found round the Mumble Head. Nor have they been taken in Whitsand Bay, near Plymouth, nor along the sandy beach round Exmouth, in all which places *Talitri* abound.* It has also been taken by the late W. Thompson in the

* We are indebted to Professor Bell, President of the Linnæan Society, for the following note on the present species:—"Walking along the shore at Bognor, on a stormy day and at high tide, I saw them crawling in great numbers up the sides of the wooden 'groins' (a sort of breakwater so called) to which situation they appeared to be driven to avoid the violence of the waves beneath. I found them to consist of what I believe to be the two sizes of one species, many possessing the strong, prehensile hand on the second pair of limbs, and the broad, dilated articulations on the seventh pair belonging to this species, and others without these peculiarities. On the latter alone, and very commonly on these, I found eggs; they were, in fact, all females, and the others, doubtless, all males; and as they were found promiscuously together, and none of any other form, I could not but come to the conclusion above mentioned, especially as they agree in all other characters."



County of Dublin, and is numerous on the shores of Plymouth Sound, under Mount Batten, where *Talitri* may also be taken; but the latter appear to occupy a higher coast-line, where the soil is sandy.

The eggs of this species are of the same colour as the female, and, after exclusion, the young are carried about by the mother beneath the body.

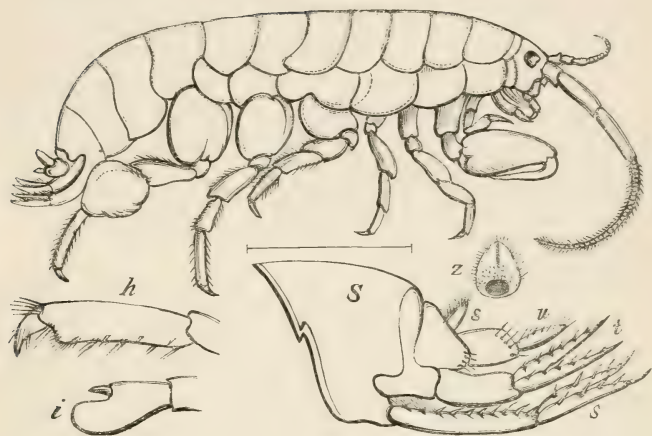
Professor Kinahan informs us that Mr. Williams, of Drogheda, has observed them in Mornington Bay to be phosphorescent.

Several specimens have been sent to us as *Orchestia Bottæ*, M.-Edw. (a native of the Red Sea), but, taking into consideration the fact announced by Rathke, that the dilated and tubercular character of the posterior pair of legs is only the result of age, we have considered that *O. Bottæ*, as a species, is at least doubtful, and, at all events, the supposed British form is only that of a youthful *Orchestia* of the present species.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.



ORCHESTIA MEDITERRANEA.

Specific Character.—*Male.*—Second pair of gnathopoda having the propodos broad posteriorly, and gradually tapering to a point anteriorly; palm very oblique, smooth, occupying nearly the whole of the inferior margin; posterior pair of pereopoda having the meros and carpus broad in mature adults.

Female.—First pair of gnathopoda having the propodos long and cylindrical: the palm short; the inferior angle but slightly tuberculated.

Length of full-grown males about $\frac{1\frac{2}{3}}{30}$ of an inch.

- | | |
|----------------------------|--|
| <i>O. mediterranea</i> , | COSTA, Rend. dell. Accad. Sci. Napoli, p. 171, 1853.
SPENCE BATE, Cat. Amph. Brit. Museum, p. 24, pl.
iv. fig. 5. |
| <i>O. littorea</i> , | MILNE-EDWARDS, Ann. Sc. Nat. t. 20, Hist. des Crust.
iii. p. 16, Règne An., Edit. CROCHARD, Crust. pl. 59,
f. 3 (males), fig. 2 b-2 j (details). RATHKE, Fauna
der Krym, t. 5, fig. 1-6. LUCAS, Exped. dans
l'Algérie. |
| <i>O. littorea</i> , var., | WHITE, Hist. Brit. Crust. p. 163. |
| <i>O. lævis</i> , | SPENCE BATE, Ann. Nat. Hist. 2nd ser. 1857, xix,
p. 136. WHITE, Cat. Brit. Mus. Crust. p. 48. |

THE eyes in the male are black, irregularly round, and situated near the top of the head. The superior antennæ reach to the extremity of the penultimate joint of the peduncle of the inferior. The inferior antennæ are about one-third the length of the entire animal; the last joint of the peduncle is not longer than the preceding; the terminal articulated portion is about the same length as the peduncle. The first pair of legs have the hand not longer than the wrist, and the palm about half as broad again as the diameter of the hand near the centre.

The second pair of legs have the hands very large, long, and tapering anteriorly. The inferior margin is slightly concave anteriorly, and no spine, tooth, or angle marks the termination of the palm, which appears to occupy the whole length of the inferior margin. The finger, when closed, reaches to the posterior extremity of the hand, but only impinges against it for about one-third of its length, the rest standing off so as to leave a hollow between the hand and compressed finger. The fifth pair of legs are shorter than the two posterior pairs, the last being somewhat the longest. They are all stout and strong limbs fringed with bunches of stout, blunt, spine-like hairs. The posterior pair have, in mature males, the wrist and the joint preceding it, developed very broadly. The appendages of the tail are short, stout, and spinous.

The female is not quite so large as the male, and differs from it but slightly. The first pair of legs are longer, and have the palm shorter, so that the inferior margin of the hand runs parallel with the superior margin. The second pair of legs are small, membranous, and feeble. The finger is reduced to a rudimentary

state, and articulates remotely from the apex; it is so short that it cannot reach to the extremity of the hand. They are useless as organs of prehension, and appear too feeble to hold, even if they could grasp, any object. The three posterior pairs of legs are nearly equal in their length, being strong and efficient organs for perambulation, and fringed with stout hairs. The posterior pair never have the fourth and fifth joints broader than those upon the two preceding pairs of legs.

This is a very active and vivacious creature. It hops, when disturbed, to a considerable distance, taking a direction always towards the sea. The female, from its compressed form, and the fact that it can move the legs only in a vertical plane, falls upon its sides and wriggles along, until it intends to give a spring, when, having managed to support itself upon its feet, with the posterior portion of its body doubled up close beneath, it boldly strikes out its tail with a force which sends it several feet. By this means the caudal stylets and spines are often broken or worn away. The male, by means of the warty excrescence upon the last pair of legs, is enabled to walk without falling upon its side. This enlargement of the middle joints of the last pair of legs is not common to all the species of this genus, and in those to which it belongs, it is developed only in the adult state, and, according to Rathke, increases with age. It is not a complete enlargement of the whole limb, but one of breadth of a part only; the leg existing in its normal size as a ridge upon the inner surface.

The female of *O. mediterranea*, according to Risso, carries eggs many times during the year. The eggs of this species are in an early stage of a deep purple colour, but the young, when they first quit the pouch of the parent, are of a bright orange. This species, particularly the

female, bears a close resemblance to that of *O. littorea*, agreeing with it both in colour and habits ; but we are not sure that it is so common, or that they are found associated together, although frequently confounded with each other. Edwards, Rathke, and Lucas have so mistaken it, supposing it to be Montagu's species, as we have ascertained from an examination of the typical specimens in the British Museum and the Museum of the Jardin des Plantes.*

We first took the species under a stone far above high-water mark in Langland Bay, near Swansea. It was so far from the shore that the grass grew all round the stone, beneath which it was associated with terrestrial Isopoda (*Oniscidæ*). We have also taken it on the shore near the Bailey Lighthouse on the Hill of Howth, in Dublin Bay, in the month of October sparingly, but it was found in numbers, and of various sizes, in the month of January, among gravel on the beach of Rough Island, Shangford Lough, by Mr. W. Derragh, by whom it was communicated to the late Mr. W. Thompson. These specimens are now (together with his whole collection) in the Museum of Belfast, and we have much pleasure in returning our thanks to the trustees of that excellent institution for the use of the whole of the *Edriophthalma* collected by that late eminent Irish naturalist. Professor Kinahan has taken it seven feet above tide-mark, mixed with *Oniscus murarius*, *O. fossor*, *Armadillo vulgaris*, and *Porcellio scaber*. These are the only recorded British habitats, a circumstance that arises most probably from the species being mistaken for *O. littorea*,

* We take this opportunity of expressing our obligation to the officers of both these institutions for the courteous reception we have invariably met with from them, the willingness with which every specimen has been placed at our disposal, and the forestalment of our wants in facilitating their examination.

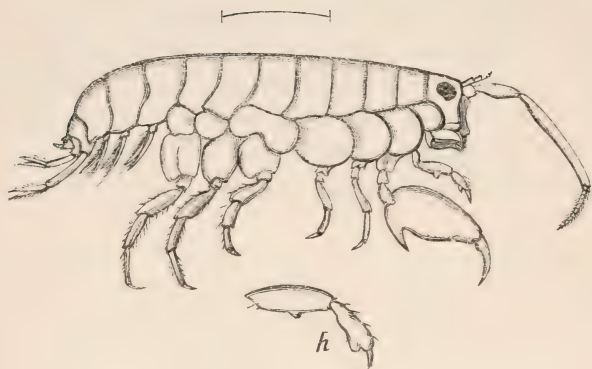
since we are enabled to trace it along the coasts of the Mediterranean (according to Edwards, Costa, and Lucas) to the shores of the Crimea (Rathke).

The following vignette of Caswell Bay is from the pencil of our friend Mr. Lewis Dillwyn, M.P. for Swansea. Caswell Bay is of a similar character to, and only separated by a ridge of mountain limestone from, Langland Bay, where the species was first taken.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.



ORCHESTIA DESHAYESII.

Specific character.—Second pair of gnathopoda, having the propodos tapering, the palm occupying nearly the entire length of the inferior margin, defined by a large tooth at the inferior angle.

Length $\frac{1\frac{1}{2}}{20}$ of an inch.

Orchestia Deshayesii. AUDOUIN, Explic. Savigny, Crust. Egypte, pl. xi. fig. 8. MILNE-EDWARDS, Crust. iii. p. 18, Ann. Sc. Nat. xx. p. 361. WHITE, Catal. Brit. Crust. p. 48. Popul. Hist. Brit. Crust. p. 163. SPENCE BATE, Ann. Nat. Hist. February, 1857.

EYES black, large, irregularly round. Superior antennæ reaching to half the length of the penultimate joint of the peduncle of the inferior. Inferior antennæ about half as long as the body of the animal. The last joint of the peduncle as long again as the penultimate, and nearly three times as long as the articulated termination. First pair of legs small, the palm but little broader than the hand, the inferior angle obtusely rounded: the hand not so long as the wrist: wrist with a small tubercle near the centre of the inferior margin. Second pair of legs with the hand large and long, broad near the wrist, and tapering towards the

finger: palm occupying nearly the whole of the inferior margin, with a large tooth at the inferior angle, against which the extremity of the curved finger impinges when closed. The coxa of the fifth pair of legs is bilobed, but is not quite so deep as the coxa of the preceding pair. Fifth pair of legs shorter than the sixth and seventh.

This species was first taken by Savigny in Egypt, when he visited that country with the first Napoleon. A specimen in the British Museum was taken on the British coast. One in the Museum at the Athenæum, Plymouth, was taken by the late Dr. Edward Moore, under Mount Batten, in Plymouth Harbour. An English specimen of an unknown locality has been for many years in Mr. Westwood's collection, and Professor Kinahan, who states that it is local and rare, has sent us specimens from Carrickfergus. In its general form it is less compressed than *O. littorea*. The widely separated recorded habitats induces us to believe that, like *O. mediterranea*, it has hitherto been overlooked, a fact that has been too common in this order of Crustacea.

The accompanying vignette of Mount Batten is from the pencil of our friend Mr. Philip Mitchell, of the New Water Colour Society.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.

Genus—ALLORCHESTES, DANA.

DANA, United States' Expl. Exped. p. 883. Proc. Amer. Acad. Arts and Sci. ii. p. 206. Amer. Jl. Sci. 2nd ser. viii. p. 136.

Generic character.—Like *Orchestia*, but the superior antennæ are longer than the peduncle of the inferior. Maxillipedes unguiculate. Carpus of the second pair of gnathopoda inferiorly and anteriorly produced. Telson single.

THE superior antennæ are at least as long as the peduncle of the inferior. The inferior antennæ have the two basal articulations not so closely incorporated with the head as in *Orchestia*; they are, moreover, furnished with a small olfactory denticle. The mandibles are without any palpiform appendage. The foot-jaws terminate in a sharp point. The two anterior pairs of legs have subchelate hands. Coxæ of the fifth pair of legs shorter than those of the fourth. Caudal appendages short and robust.

Dana established this genus for the reception of certain species of Amphipods which had been attributed by authors to various genera. It more nearly resembles *Orchestia* than any other genus, but is very easily distinguished from it by the length of the superior antennæ.

Upon first consideration, it would seem that this slight difference could scarcely be of sufficient importance to warrant a generic separation. Closer inspection, however, shows that it is associated with some important changes both in the structure and habits of the animals.

The inferior antennæ have the basal articulation not so closely fused with the head as in *Orchestia*, and a small olfactory denticle is visible. The foot-jaws terminate in a sharp curved nail. The hands of the first two pairs of legs are subchelate in both sexes. The anterior pair are small, the second are generally large and powerful in the male. In the female, though occasionally smaller than those of the male, they are never rudimentary, and are generally developed upon the type of the male, except that the wrist is produced along the inferior margin of the hand. The first joint (or coxa) of the first four pairs of limbs is large and squamiform, being nearly as deep as the body of the animal. The first joint of the fifth pair of legs is much shorter than that of the preceding pairs. The caudal appendages are short and stout, the posterior being unbranched.

In habits as well as in organization, *Allorchestes* occupies a position between *Orchestia* and *Gammarus*. It is a littoral genus, dwelling generally under weed upon the shore, and in pools left by the sea. One species only, *A. medius*, is recorded by Dana as having been taken by the dredge in two separate localities, in several fathoms of water.

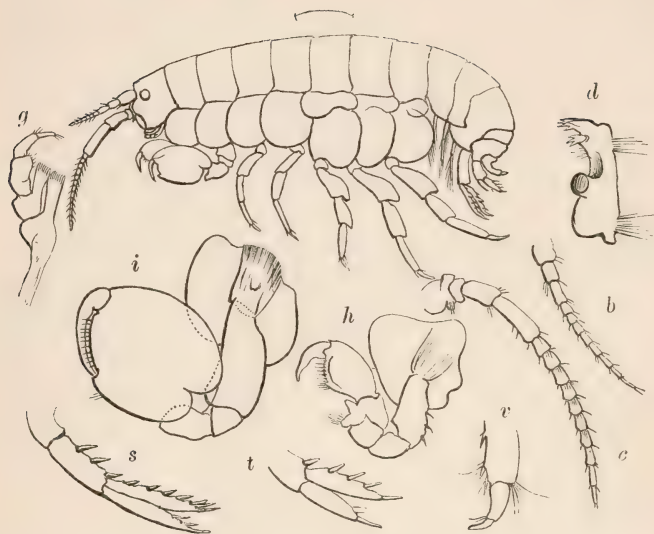
The geographical range of this genus is very wide. It is found throughout the temperate and subarctic zones of both hemispheres.

Under the name of *Enone* Risso has described (Europe meridionale, p. 96) a genus which we believe to be identical with the present; but the description is so destitute of distinctive characters, that it is not sufficient to warrant its acceptance even as a synonym.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.



ALLORCHESTES NILSSONII, Rathke.

Specific character.—MALE. Superior antennæ as long as the peduncle of the inferior. Inferior antennæ one-third the length of the animal. Second pair of gnathopoda larger than the first. Propodos ovate, large, with convex palm and an obtuse point at the inferior angle.

Length $\frac{4}{30}$ of an inch.

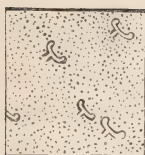
- Amphithoe Nilssonii* RATHKE, Beit. zur Faun. Norv. in Nov. act. xx. p. 264 c.
 „ *Prevostii* „ „ l. c. p. 81, pl. 4, fig. 5 (not of MILNE EDWARDS). LILJEBORG, in Ofvers. af Kongl. Vetensk. akad. Forhandl. 1851, p. 22.
Allorchestes Nilssonii, BRUZELIUS, Bidrag. till Käm. om Skand. Amph. Gam. p. 35. SPENCE BATE, Cat. Amph. Brit. Mus. p. 38, pl. vi. fig. 4.
 „ *Danai*, SPENCE BATE, Rep. Brit. Assoc. 1855, p. 57. Ann. Nat. Hist. Feb. 1857. WHITE, Hist. Brit. Crust. 1858, p. 163.

THE eyes are not large, but round and black. The superior antennæ reach to the extremity of the peduncle of the inferior. The inferior antennæ are about one-fourth the length of the whole animal, with the peduncle about half the length of the antennæ. The two basal joints are closely incorporated, but not fused, with the head. The mandibles are short, denticulated at the margin, furnished with a secondary plate, but destitute of any palpiform appendage. The foot-jaws are furnished at the apex with a sharp nail. The squamiform plates are three, two important, the third less so, fringed with short hairs. The first pair of legs have the hand oval, or nearly so, when the finger is shut: the palm is convex, and an obtuse tooth is placed just beyond the apex of the shut finger: the wrist is moderately produced inferiorly. The second pair of legs have the hand much more developed, but formed upon the same type as the first. All the other pairs of legs terminate in curved pointed fingers.

The squamiform basal joint of the four anterior pairs of limbs is as broad as deep, and nearly as deep as the respective segment of the body to which it is attached. Those belonging to the three posterior pairs are much shorter. The caudal appendages are short, stiff, and furnished with short, spine-like hairs. The middle tail-piece is single and small.

This animal has, no doubt, been mistaken for the young of *Orchestia littorea*, to which it bears a general resemblance; but it can readily be distinguished by the length of the superior antennæ, which are rather stiff in their general appearance.

The microscopic structure of the skin shows a distinction (although not a very great one) from that of *Talitrus* and *Orchestia*. The τ -markings are somewhat more nu-



merous, and differ slightly in shape. The whole structure is dotted with granular markings, but no trace of the original cell-formation is apparent.

The hairs, which are scattered over the legs, though formed upon the same plan as in *Talitrus*, terminate in a slight, but sharp point; and the small secondary branch has a peculiar bead-like appearance.

The habitat of this animal is along the coast, between the ordinary high water-mark and that of spring-tides. In places where it is found, it appears to be more abundant than the *Orchestiæ*.

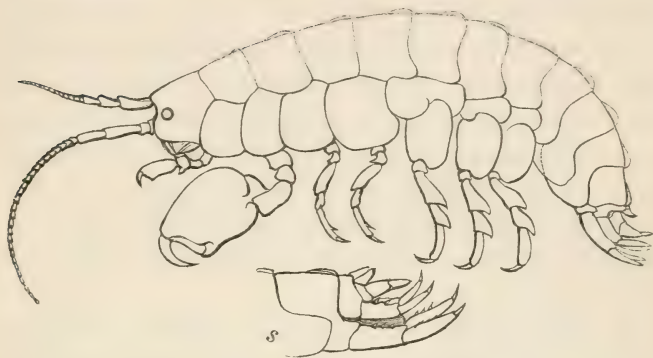
It is of a dark green colour, and, when dead, may easily be distinguished amongst many others by a metallic lustre.

We have received specimens from Penzance, sent to us by Mr. George Barlee and Mr. W. Webster; from Moray Frith, by the Rev. Geo. Gordon; from Falmouth and Tenby, by Mr. W. Webster; and have taken them ourselves on the shores of Plymouth Sound.

As it was from this species that our knowledge of the genus was first obtained, we named it originally after the illustrious American carcinologist, by whom the genus was founded; but, upon further examination, we believe it to be identical with *Amphithöe Nilssonii*, of Rathke, and which he first regarded as identical with *Amphithöe Prevostii* of Edwards.

AMPHIPODA.
SALTATORIA

ORCHESTIIDÆ.



ALLORCHESTES IMBRICATUS.

Specific character.—Dorsal median line slightly carinated and imbricated. The inferior antennæ more than twice the length of the superior. First pair of gnathopoda very much smaller than the second pair.

Length $\frac{7}{20}$ of an inch.

Allorchestes imbricatus, SPENCE BATE, Report Brit. Assoc. 1856, p. 57.
Ann. Nat. Hist. Feb. 1857. Cat. Amph. Brit.
Mus. p. 41, pl. vi. fig. 8. WHITE, Pop. Hist.
Brit. Crust. 1858, p. 164.

THE eyes of this species are small and round. The peduncle of the superior antennæ is quite half the length of the antennæ, and reaches nearly to the extremity of the peduncle of the inferior. The first pair of legs have the hand more than as long again as broad; the wrist is but slightly produced inferiorly. The second pair of legs have a very large and powerful hand, with the palm slightly oblique, and the finger fitting into a groove. The hand is broader posteriorly than at the palm. The four anterior pairs of squamiform coxæ are large, but scarcely so deep as the respective segments of the body to which they are attached. Those of the fifth pair of legs are about half as deep as the preceding, and are

formed of two equal lobes. The second scale-like joint of the last three pairs of legs is oval. The caudal appendages are short and strong.

The animal generally is longer and more compressed than *A. Nilssonii*. The dorsal ridge is slightly elevated into a carina, which is most conspicuous towards the posterior limit of each segment. This gives to the animal, when viewed laterally, an imbricated appearance, from which circumstance we have taken the name, and by which the species can easily be determined from any other known British form.

A. imbricatus appears to be rather local. The first specimens that we received were from Penzance, where they were taken by Mr. George Barlee, between tide-marks. In company with Professor Kinahan we have found them on the Breakwater at Plymouth, where they live in small pools left in the holes worn by the wash of the sea in the surface of that stupendous work. We found many individuals, and they appeared to be the only species of Amphipod that existed there. The colour was a bluish-grey, but a few were almost black.

The following vignette is a sketch of the Western end of the Breakwater by Mr. Philip Mitchell, of Plymouth.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.

Genus—NICEA, NICOLET.

NICEA, NICOLET in Gay's Chili, vol. iii. p. 237, 1849.

GALANTHIS, SPENCE BATE, Brit. Assoc. Report, 1855, p. 57 ; Ann. Nat. Hist. 1857.

Generic character.—Antennæ small, subequal ; both pairs of gnathopoda subchelate. Coxæ of the third pair of pereopoda much shorter than the preceding. Telson deeply cleft.

THE antennæ are small and slender, being scarcely one-fourth the length of the animal, and the superior are almost as long as the inferior. The mandibles are longer than deep : they are furnished with a secondary incisive plate ; and a tubercle marks the position of the absent appendage. The foot-jaws have squamous plates arising from the second and third joints, which terminate in sharp stiff hairs, or spines. The first two pairs of legs are formed upon the same type, and are subchelate. The first four pairs of legs have the squamiform basal joint as deep as the body, the fifth much shorter. The three posterior pairs of legs are nearly equal in length. The middle tail-piece is deeply cleft or divided.

This genus differs from *Allorchestes* in the approximate length of the antennæ, which appears to be attributable rather to the shortness of the inferior than the length of the superior, and also in the middle tail-piece being divided.

The genus *Hyale*, of Rathke, seems to approach near to this, the only distinction being in the last pair of

caudal appendages, which are unibranched throughout this family, but which are doubly branched in *Hyale*.

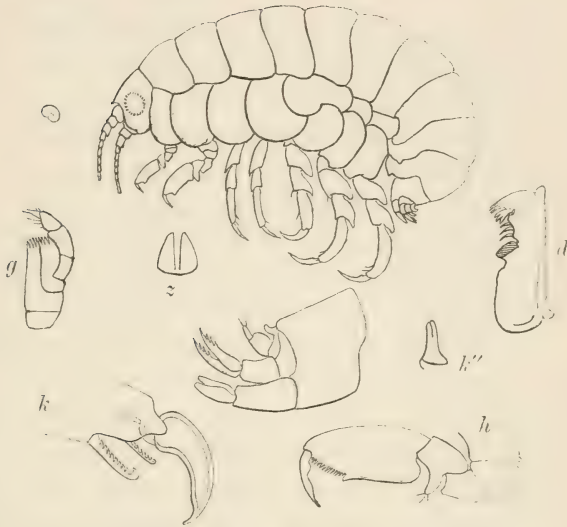
Only two species of this genus are known, and these are from habitats widely asunder: *Nicea Lucasii*, inhabiting the western coasts of South America, and our own British species.

The following vignette represents a village of fishermen's huts in the Island of St. Kilda. They are built upon the plan of the houses of the Ancient Britons, and are within lined with the feathers of sea-fowl.



AMPHIPODA.
SALTATORIA.

ORCHESTIIDÆ.



NICEA LUBBOCKIANA.

Specific character.—Antennæ short, subequal in length. Gnathopoda subequal in size : palm slightly oblique. Telson deeply cleft.

Length $\frac{3}{20}$ of an inch.

Galanthis Lubbockiana, SPENCE BATE, Brit. Assoc. Report, 1855, p. 57.
Ann. Nat. Hist. 1857. WHITE, Popul. Hist.
Brit. Crust. p. 164.
Nicea ,, SPENCE BATE, Cat. Brit. Mus. p. 51.

THE eyes are round; the anterior pair of antennæ are scarcely longer than the head. The inferior is scarcely as long as the superior. The first pair of legs are subchelate; the hand is longer than broad, the palm straight, oblique, fringed with fine cilia; the inferior extremity terminates in an obtuse tooth; the inferior margin is

parallel with the superior; the wrist is short and inferiorly produced. The second pair of legs are formed upon the same type, and are scarcely larger than the first. The walking legs are all short and stout, terminating in a sharp curved finger; the caudal appendages are very short and strong, and fringed with but few spines; the terminal appendage is deeply cleft.

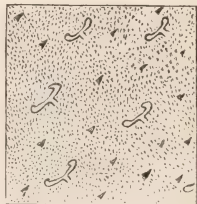
The animal is not much compressed, and all the segments of the body are uniform in length: a circumstance which enables it to roll itself into a more perfect sphere than Amphipods generally do—a fact by which it may readily be detected amongst a number of other species.

We have never seen any of this individual species alive; but in dead specimens the eyes lose all colouring matter. The antennæ are short and slight, gradually decreasing in diameter from the base, the first joint being the largest, the rest gradually smaller, and the articuli of the flagella lessen in the same degree, so that there is no decided distinction between their respective peduncles and flagella.

The walking legs are all strong and short, the antepenultimate being shorter than the two posterior. They are all furnished at the extremity of the foot with two stout spines, curved at the apex, and serrated on the sides facing the finger against which they impinge when closed (*k*).

The animal generally is free from hairs or spines, some small ones, however, exist upon the antennæ, and a few others may be found upon the legs, short and somewhat pyriform in shape, with the apex cleft into two equal parts (*k'*).

The integument under the microscope shows the τ -like mark peculiar



to the family, somewhat modified from the previous genera, and as exhibited in the preceding cut:—The skin is also granulated all over, and is interspersed with minute solitary hairs.

We have received many specimens of this species from Falmouth, sent by Mr. W. Webster; from Penzance by Mr. Harris, and Mr. G. Barlee; and from the coast of Northumberland by Mr. Joshua Alder.

We have named the species in compliment to our friend John Lubbock, Esq., F.R.S., &c., whose name is so intimately associated with Crustacea, and to whom we take this opportunity of acknowledging our obligations.

The accompanying vignette is by the pencil of Mr. Sydney Whiteford.



Tribe—NATATORIA.

IN this tribe the superior antennæ are always longer than the peduncle of the inferior pair. The third pair of caudal appendages reach as far as the extremity of the second pair. The hairs upon every part of the animal are generally slight and flexible, never short, stiff, and double-headed, as found upon the animals in the tribe SALTATORIA.

The habits of the animals in this tribe are aquatic, the most littoral living at half-tide under weeds and stones, but by far the greatest number of the species are found in the water.

The common mode of progression is by swimming. This act is performed by the constant play of the three pairs of limbs succeeding the last pair of feet, which thus receive the common synonym of natatory legs. These are long, multiarticulate, pliable, and feathery; they brush the water with a constancy equal to that of the fins of a fish in motion, and propel the creature with considerable velocity. It is from this circumstance that the name of the tribe has been derived. If accidentally thrown upon dry land, they have neither the power to walk nor to leap—they consequently wriggle along upon one side, a circumstance which has obtained for them the familiar cognomen of “sea-screws.” This tribe contains but a single family.

Fam.—GAMMARIDÆ.

THE antennæ are well developed, and generally sub-equal. The inferior pair are inserted in a notch at the infero-anterior angle of the cephalon, with which, how-

ever, they are not soldered. The maxillipeds are unguiculate. The four anterior pairs of coxæ are largely developed.

This family consists of several subfamilies, which differ from each other in more or less important points. The superior antennæ are generally subequal to the inferior, and bear a secondary appendage at the base of the flagellum. This peculiarity, although occasionally absent in the adult state, is, we believe, invariably found in the young. One or both pairs of the fore-legs or arms have subchelate hands.*

Sub-family.—STEGOCEPHALIDES.

Antennæ more than one-fourth the length of the animal, subequal. Coxæ of the second pair of gnathopoda, and of the first and second pairs of pereopoda monstrously developed.

IN some genera the coxæ of the first pair of legs are rudimentary, or, at least, not developed into scales; whereas the second is always large, covering the preceding when not squamiform. The hands are subchelate, and the caudal appendages are styliform. The middle piece of the tail is always single.

This sub-family was established by Dana under the name of *STEGOCEPHALINÆ*, for the reception of Kroyer's genus *Stegocephalus*. But there are several other genera which evidently fall within its definition. The principal feature, and one easily recognizable, is, the large size of coxæ of the first two pairs of walking legs. These are so monstrously developed, that the animal has the power, when rolled up, of protecting, under this shield-like

* By a subchelate hand is meant one in which the finger folds upon the hand, but in which the inferior angle of the palm is not produced into an antagonistic thumb.

structure, the head, much of the posterior part of the body, and all the legs and other appendages.

In the absence of an articulated appendage to the mandibles, and the unibranched termination of the posterior pair of caudal appendages, some of the genera approximate to the ORCHESTIIDÆ, whereas others gradually approach the forms of the next sub-family of the GAMMARIDÆ.

There are but two genera which represent this sub-family upon the British coasts, all the rest being exotic. Some species of *Stenothœ*, a genus that differs from *Montagua* in no very marked degree, found upon the coast of the United States, bear a representative relation to the British forms.

AMPHIPODA.
NATATORIA.

STEGOCEPHALIDES.

Genus—MONTAGUA.

Montagua, SPENCE BATE, Report Brit. Assoc. 1855, p. 57. Synopsis Brit. Amph. Ann. Nat. Hist. 1857, xix. p. 137. Cat. Amph. Brit. Mus. p. 54. WHITE, Pop. Hist. Brit. Crust. p. 166.
Leucothoë, KROYER (not LEACH), Nat. Tids. iv. p. 141 (2), i. p. 539, 1845.

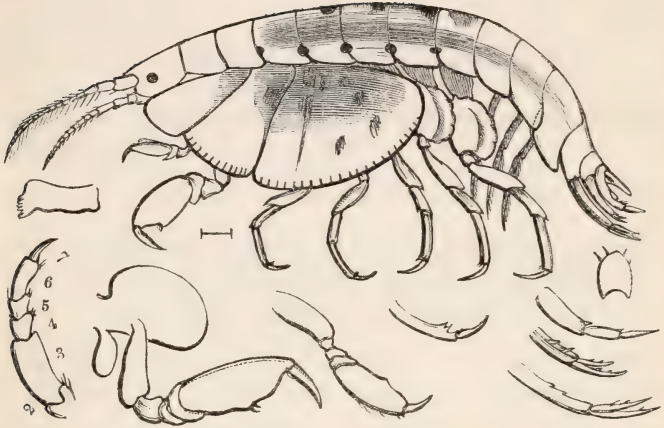
Generic description. Antennæ subequal. Superior pair without a secondary appendage. Gnathopoda subchelate. Coxa of second pair covering those of the first. Telson entire.

THE antennæ are nearly equal in length: the superior do not possess a secondary appendage. The mandibles are without an articulated appendage. The foot-jaws are without squamous plates, and terminate in a hook. The two anterior pairs of legs are unequal, subchelate; the first pair having the first joint not squamiformly developed; the second pair are larger than the first, having the first joint squamiformly developed to considerable dimensions, and overlapping that of the first pair. The remaining legs are subequal. The coxæ of the three last pairs are small. The caudal appendages are styliform, the last pair having but a single branch, which is double-jointed. The terminal scale is squamous and entire.

This genus is named after Colonel Montagu, who was a worthy pioneer in this branch of Zoology, and the discoverer of the first species.

AMPHIPODA.
NATATORIA.

STEGOCEPHALIDES.



MONTAGUA MONOCULOIDES.

Specific character. Second pair of gnathopoda having the propodos twice as long as broad, palm oblique, smooth, slightly convex, defined by a very obtuse angle armed with two sharp short spines.

Length, $\frac{3}{20}$ of an inch.

Cancer (Gammarus) monoculoides, MONTAGU, Trans. Linn. Soc. vol. xi. p. 4, pl. ii. fig. 3.

Montagua monoculoides, SPENCE BATE, Rep. Brit. Assoc. 1855, p. 57. Synop. Brit. Amph. Ann. Nat. Hist. 1857, xix. 137. Cat. Brit. Mus. p. 55, pl. viii. fig. 4.

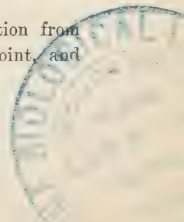
Typhis (?) monoculoides, MILNE-EDWARDS, Ann. Sci. Nat. t. xx. Aug. 1830. WHITE, Cat. Brit. Crust. in Brit. Mus. 1850, p. 58. GOSSE, Mar. Zool. p. 140, fig. 252.

THE head produced anteriorly into a small depressed rostrum. The back smooth. The eyes are round, and of a red colour. The superior antennæ have each joint of the peduncle successively reduced in size, the flagellum

is composed of many small jointlets,* each having several cilia. The inferior pair are shorter than the superior, and less robust. The mandibles are long and narrow, and furnished with a serrated cutting margin. The outer pair of foot-jaws have the third and sixth joints respectively longer than the fourth and fifth conjoined: the seventh terminating in a sharp point. The first pair of legs are short and slender, having the first joint not developed into a scale; the hand is longer than the wrist, and developed in the same form as that of the second pair; the palm is very oblique, and defined from the inferior margin by a very obtuse angle.

The second pair of legs have the first joint large, scale-like, narrow, increasing in breadth gradually from the body, and reaching so far in front as to cover the appendages of the mouth; the wrist is short; the hand long, ovate; the palm oblique, slightly convex, and defined by an obtuse angle, armed with two short sharp spines, against which the apex of the slightly-curved finger impinges. The third pair of legs have the first joint more largely developed than that of the preceding pair of limbs, and with the inferior margin fringed with minute equidistant cilia, situated within the edge; the foot is slightly bent, having the margins parallel, and armed upon the inner distal extremity with two short sharp spines, against which the finger impinges near the base, thus giving the foot a prehensile capability. The fourth pair of legs are like the third, but have the first joint still more largely developed, being not only produced anteriorly, parallel with the preceding, but extending as far back as the penultimate pair of legs.

* The term jointlet, or articulus, is used to indicate its distinction from a joint: some authors have described the flagellum as a single joint, and others as if every articulus was a distinct joint.



The inferior margin of this appendage is, like the one last described, fringed with a row of equidistant solitary cilia. The fifth, sixth, and seventh pairs of legs are uniform, except that the second joint of the fifth pair is not developed like a scale, which is the case with the second joint of the two other pairs. Their first joints are small, almost rudimentary, and exhibiting but slight traces of their scale-like character. In all other respects the last three pairs of legs resemble in appearance those of the two preceding pairs, with the exception of being affixed in a reversed position, according to the common type of the order.

The three pairs of swimming appendages are long and slender. The three pairs of caudal appendages are strong, stiff, and pointed; the penultimate is shorter than the other two. The last pair has its branch with the apical joint nearly as long as the preceding. The terminal scale is ovate, fringed with three or four short hairs.

The colour of this species is white, or flesh-colour, marked with a large blotch of bright crimson on the back and side, and with a few darker spots of the same colour, as represented by the shading in the accompanying figure. A single specimen that we obtained from the neighbourhood of the Eddystone Lighthouse was marked all over with red spots. It only appeared to differ from the present species in having the palm of the hand of the second pair of arms slightly crenulated.

It appears not to be uncommon on our shores: it is a sublittoral species, and exists probably all round Europe, being found beneath stones in pools, near low water at spring-tides.

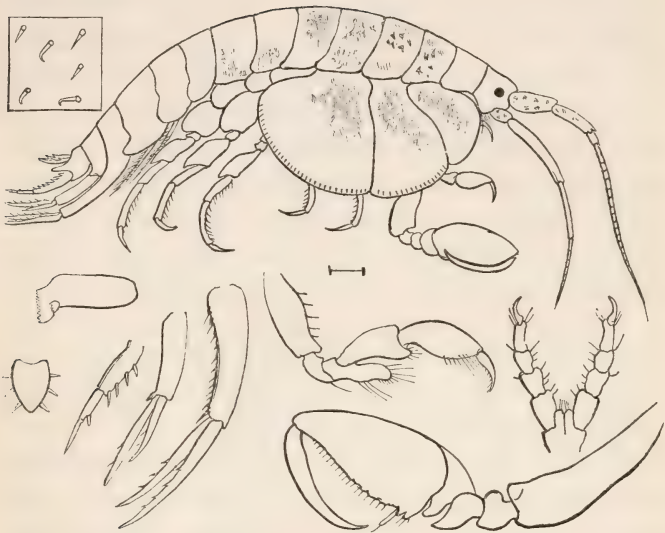
It has the capability of rolling itself very perfectly within the defensive armour provided by its largely-developed coxæ.

The first specimen, found by Colonel Montagu and still preserved in the British Museum, is thus rolled up, which circumstance, together with Montagu's incomplete figure in the Linnæan Transactions, may account for the circumstance of its so long having escaped the analysis of inquiring carcinologists. We have carefully examined the type in the British Museum, and have no doubt of the correctness of our identification of it with the specimen represented in our figure. We may, however, observe, that the terminal joint of the peduncle of its lower antennæ is more decidedly elongated, the spines on the under-edge of its hands stronger, and the two divisions of the middle appendages of its tail longer. This specimen was taken from Montagu's favourite hunting-ground, Salcombe Harbour, Devonshire.

We have also received specimens from the following localities:—Falmouth and Tenby, Mr. Webster. Penzance, Mr. Harris and Mr. G. Barlee. Moray Frith, Rev. Mr. Gordon. Skye and Shetland, Mr. Barlee. Plymouth, Mr. Howard Stewart, and C.S.B. Sligo and Belfast Bay, Ireland, Mr. W. Thompson.

AMPHIPODA.
NATATORIA.

STEGOCEPHALIDES.



MONTAGUA MARINA.

Second pair of gnathopoda having the propodos long and tapering, with the palm nearly straight, occupying almost the entire length of the inferior margin.

Length, $\frac{4}{20}$ of an inch.

Montagua marina, SPENCE BATE, Brit. Assoc. Rep. 1855, p. 57. Synopsis Ann. Nat. Hist. 1857, xix. 137. Cat. Amph. Brit. Mus. p. 56, pl. viii. fig. 5. WHITE, Pop. Hist. Brit. Crust. p. 166.

THE eyes are round and red. The superior antennæ are half the length of the animal. The first joint of the peduncle is as long as the head; the second joint is quite as long as the first, but not so stout; the third is very small, both in length and breadth. The flagellum is longer than the peduncle. The inferior antennæ are nearly as long as the superior; the penultimate joint

of the peduncle reaches beyond the extremity of the peduncle of the superior. The last joint is rather more than half the length of the preceding, and the flagellum is not longer than the last joint of the peduncle. The mandibles are long, narrow, and furnished with a minutely serrated cutting margin. It is also furnished with a minute secondary moveable plate having a serrated edge. This plate we believe to be common to the genus, but is not figured in the preceding species, from the probable fact that it exists only upon one mandible, the other being without it, as shown by Mr. Westwood's dissections, published by Professor Bell, to be the case in *Stegocephalus ampullus*, the typical genus of this subfamily—where it exists upon the left mandible only. The pair of foot-jaws have all the joints subequal, the sixth being slightly longer than any of the others. The first pair of legs are short and slender, having the fourth joint anteriorly produced into a considerable process beneath the fifth. The fifth, or wrist, is nearly as long as the sixth, or hand, which is of a long elliptical form, having the palm convex, not defined, but armed with a few cilia. The second pair of legs are much longer, larger, and more powerful than the first. They have the fourth and fifth joints very short, but both anteriorly and inferiorly produced to an angle. The hand is long; the upper margin forming an arched line continuous with that of the wrist; the palm runs diagonally with the axis of the hand, nearly straight to its base beneath, where two small tubercles, armed with a single blunt spine, carrying a small subapical bristle, define its limits. Throughout its entire length the palm is furnished with a row of equidistant solitary cilia. The finger is as long as the palm, somewhat curved, and tapering to the point, which, when closed,

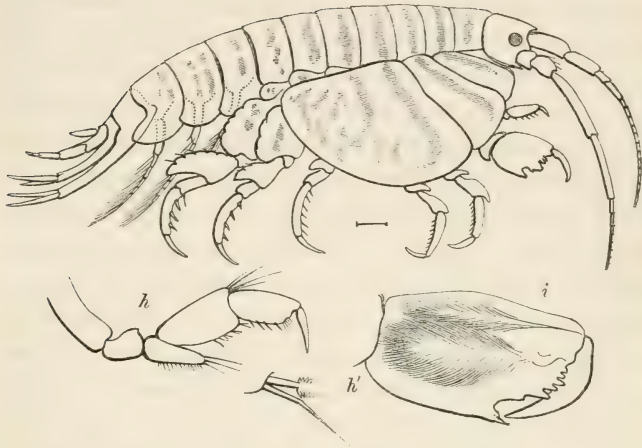
impinges against the two small teeth at the base of the palm. The animal, in other respects, closely resembles *M. monoculoides*, except that the terminal scale of the tail is more pointed. The colour of the animal, when alive, is yellowish, or pale flesh-colour, several parts of the body and coxæ marked with faint blotches of light rose, or pink. The structure of the integument is very free from any decided markings; but the surface is in different parts furnished with very minute cilia, which are nowhere thickly planted.

We have received specimens of this species from the coast of Northumberland, from Mr. Joshua Alder; also from Banff, Mr. Edward; and from Macduff, from Mr. Gregor; we have found it ourselves amongst some trawl refuse brought to us from near the Eddystone Lighthouse.

We have also received a specimen, which we consider to be only a variety of this species, from the coast of Piedmont, collected by Mr. Gwynn Jeffreys: it varies from the type in having the palm of the second pair of legs somewhat less than the entire length of the hand. This specimen was taken upon the shore, whereas all those recorded as British have never been taken in less than ten fathoms of water—a circumstance not of much importance in itself, but as adding to the testimony of the late Professor Edward Forbes, that species taken in the deep sea in northern latitudes, when they exist near the equator, inhabit shallow water.

AMPHIPODA.
NATATORIA.

STEGOCEPHALIDES.



MONTAGUA ALDERI.

Specific character. Second pair of gnathopoda having the propodos short ; palm serrated near the base of the dactylos, and deeply emarginated near the inferior angle, which is produced to a sharp point.

Length, $\frac{3}{20}$ of an inch.

Montagua Alderii, SPENCE BATE, Rep. Brit. Assoc. 1855. Synop. Brit. Amph. Ann. Nat. Hist. 1857, xix. 137. Cat. of Amph. Brit. Mus. p. 57, pl. viii. fig. 6. WHITE, Pop. Hist. Brit. Crust. p. 166.

THE eyes, as in all the other species of the genus which we know, are round and red. The superior antennæ are nearly one-half the length of the animal, having the flagellum rather longer than the peduncle. The inferior antennæ are longer than the superior, and the peduncle reaches nearly to the extremity of the superior antennæ ; the two last joints of the peduncle are nearly of equal length, the last being rather the shorter, and the flagellum is not longer than the last joint of the peduncle. The first pair of legs are slender, and have the fourth joint

inferiorly produced to nearly half the length of the carpus, and furnished at the apex with a few hairs, some of which are straight, while others are of a form which appears to be peculiar to this species, consisting of a kind of plumose tuft, or brush mounted on a stalk (fig. *h'*). The wrist is long, and increases in breadth towards the extremity. The hand is shorter and narrower than the carpus; the form is long-ovate, having the upper and lower margins slightly convex; the palm is short, oblique, and imperfectly defined; the finger is much longer than the palm, and is nearly straight, a circumstance which demonstrates it to be a feeble organ of prehension. The second pair of legs are much more powerful and longer than the first. The wrist is short, and the hand is quadrate, being but a little longer than broad; the palm is oblique, and serrated with coarse, irregular, blunt teeth on the half nearest the base of the finger, and deeply emarginate towards the inferior angle, which is produced to a sharp point. The finger is arched, and impinges, when closed, into the emargination of the palm, which, from the irregular form of the latter, must enable it to hold securely any object in its grasp. The specimen from which our figure was taken enabled us to see the muscles within the organ, proving that the extensor is smaller and much less powerful than that which forces the finger into contact with the palm. The other legs are all of the same length, and are tolerably strong. The second joints of the last two pairs are broadly developed, and have the posterior margin scalloped; this is also the case with the fourth joints of the same legs, which are posteriorly produced to a blunt downward point, a small hair springing from the depression between every scallop. The feet are much curved, and have the anterior margins armed with short hairs, or rather spines,

which are evidently of service in assisting the animal in securely grasping the weed, or stalks of zoophytes, as it rambles through its submarine gardens. The fingers are short and sharp. The caudal appendages do not appear to differ materially from those of the preceding species.

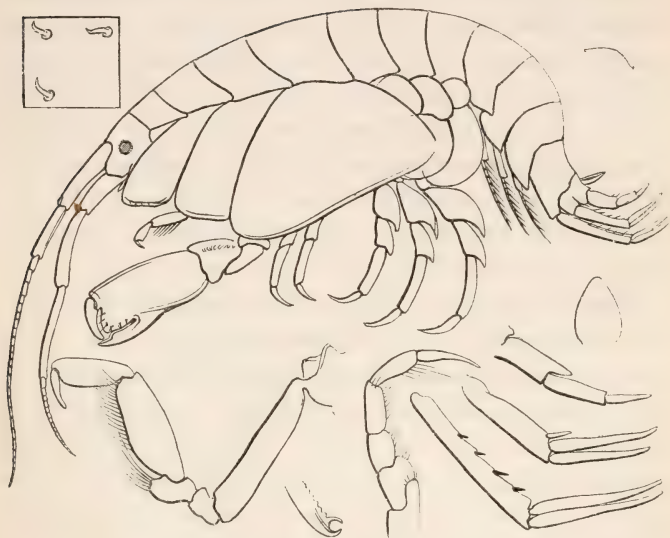
This animal, when alive, is straw-coloured, striped with bands of rose, one occurring in each segment through the body; these are continued down the sides of the animal, but grow fainter and less persistent towards the posterior extremity of the animal.

The first specimen was sent to us by Mr. Joshua Alder (in compliment to whom the species is named), and was taken by him on the coast of Northumberland, off Cullercoats; whence we have also received it from the Rev. A. Merle Norman. This spot having been rendered classic to naturalists as the field of the researches of various eminent observers, we append a vignette of it from the pencil of Mr. Alder himself.



AMPHIPODA.
NATATORIA.

STEGOCEPHALIDES.



MONTAGUA POLLEXIANA.

Specific character. Second pair of gnathopoda having the propodos as long again as broad ; palm advanced, deeply notched just within the inferior angle, which is produced into a tooth, internally concave.

Length, $\frac{1}{4}$ inch.

Montagua pollexiana, SPENCE BATE, Brit. Assoc. Report, p. 57, 1855. Synopsis, Ann. Nat. Hist. 1857, xix. 137. Cat. Amph. Brit. Mus. p. 57, pl. lx. fig. 2. WHITE, Pop. Hist. Brit. Crust. p. 167.

THE eyes are small, round, and probably red ; we have, however, only seen dried or dead specimens, from which all colour rapidly passes away. The superior antennæ are nearly two-thirds the length of the body, having the first joint of the peduncle longer than the head, the second joint a little shorter than the first, and the third small, not being distinguishable from the articuli of the flagellum. The inferior antennæ are

shorter than the superior, with the peduncle extending as far as the middle of the flagellum of the superior. The last joint of the peduncle of the inferior pair is rather longer than the preceding, and the flagellum is rather shorter than the last joint of the peduncle. The first pair of legs are slender, the fourth joint of which is but slightly produced anteriorly below, where it is tipped with long hairs; the wrist is very long, and fringed upon the lower side with fine hairs; the hand is much shorter, scarcely more than half the length of the wrist, it is also narrower; it increases in width towards the palm, which is short and imperfectly defined. The finger is as long again as the palm, and nearly straight. The second pair of legs are longer and stronger than the first; the hand is twice as long as broad, the upper and lower margins are imperfectly parallel, the form of the organ is therefore oblong-quadrate; the palm is advanced, smooth, and fringed with a few solitary hairs; just within the inferior angle is a narrow deep cleft or notch, extending in depth to about one-third the length of the hand, giving to the inferior angle of the palm, which is slightly produced in advance, the appearance of a strong thumb, hollowed upon its internal surface. From this peculiar character the specific name of the animal is derived. The finger is scarcely as long as the palm, and impinges throughout its entire length against that part of the joint. The other legs do not appear to differ much from those of *M. monoculoides*, except in the unimportant circumstance that the posterior margin of the second joints of the two posterior pairs of legs are not crenulated, and the spines that arm the distal extremity of the feet are crenulated upon one side, and curved at the tip into an imperfect hook, with a small subapical process in the opposite direction, the apices

nearly meeting. The caudal appendages have their branches nearly equal, whilst the last has the base produced into a sharp point at the upper distal extremity. The terminal scale is lanceolate.

We have not been able to determine the colour of this species, which is the largest of the genus, not having seen any living or fresh specimens. The surface of the skin is irregularly covered with very small sharp hairs, so minute that they can only be detected by a high power of the microscope. This species is nearly as large again as either of the others, and its geographical range is also considerable.

We have received specimens from our valued friend and correspondent, Mr. Geo. Barlee, who has taken them with the dredge at St. Ives, on the north coast of Cornwall, and also from the Shetland Islands. We have also received it from the coast of Northumberland, from the Rev. A. M. Norman. It also occurs, not uncommonly, in Berwick Bay, whence we received specimens many years since from the late lamented Dr. George Johnstone.

Beneath is a sketch of Whitby Rocks, on the coast of Northumberland, from the clever pencil of Miss M. Hancock.



AMPHIPODA.
NATATORIA.

STEGOCEPHALIDES.

Genus—DANAIA.

Danaia, SPENCE BATE, in Ann. Nat. Hist. 1857, xix. p. 137.

Generic character. Antennæ subequal. Superior antennæ without secondary appendage. Mandibles destitute of a palpiform appendage. First pair of gnathopoda simple. Second subchelate. Telson single.

THE superior antennæ are without a secondary appendage. The mandibles have no appendage. The first pair of limbs are slender, and terminate in a straight, sharp finger, which does not impinge against the under-side of the preceding joint. The second pair of limbs are larger than the first, and have a subchelate hand. The coxa of the first pair of limbs is hidden by that of the second, which, as well as that belonging to the third pair of limbs, is largely developed. The coxa of the fourth pair of limbs is not so largely developed as in *Montagua*, and moreover is excavated to receive the anterior lobe of the coxa of the fifth pair of limbs, which is more developed than in *Montagua*, as is also the second joint of the same pair of legs. The posterior pair of caudal appendages are unbranched, and the telson is simply squamiform.

This genus, of which we know only a single species, has received its name in honour of Professor Dana, whose work on the Crustacea has been of great assistance to us in our labour.

AMPHIPODA.
NATATORIA.

STEGOCEPHALIDES.



DANAIA DUBIA.

Specific Character. Coxæ of the second pair of gnathopoda, and of the first pair of pereiopoda, serrated upon the inferior margin. Second pair of gnathopoda having the propodos broadest at the palm, which is convex and ciliated.

Length, $\frac{3}{25}$ of an inch.

Montagua dubius, SPENCE BATE, Report Brit. Assoc. 1855, p. 57.

Danaia dubia, SPENCE BATE, Ann. Nat. Hist. 1857, xix. 137. Cat.
Amph. Brit. Mus. p. 59, plate x. fig. 1. WHITE, Pop.
Hist. Brit. Crust. p. 167.

IN general aspect this animal resembles a species of the preceding genus. The head is furnished with a straight rostrum, and the anterior lateral margin is produced anteriorly to a point in a straight line, further in advance than the rostrum. The body of the animal is smooth; but the eighth, ninth, and tenth segments indicate a slight projection posteriorly on the dorsal surface. The eyes are probably like those in *Montagua*; but they have not hitherto been satisfactorily examined.

The superior antennæ are more than half the length of the body of the animal. The first joint of the peduncle is longer than the head; the second joint is not much more than half the length of the first; the third is lost in connection with the flagellum, which is longer than the peduncle, and fringed with fine cilia; the inferior pair are not so long as the superior. The peduncle does not reach beyond the peduncle of the superior, and the flagellum is as long as the peduncle, and fringed with fine cilia. The first pair of limbs have the coxæ hid by the coxæ of the succeeding pair; they are slender, and terminate in a long straight finger. The second pair of limbs have the first joint produced inferiorly and anteriorly, so as to cover that of the first pair of limbs and the appendages of the mouth; the inferior margin is serrated upon the posterior half. The wrist is short and inferiorly produced; the hand is broader at the palm than near the wrist; the palm is convex, slightly oblique, fringed with hairs, and imperfectly defined, the inferior angle being rounded. The third pair of limbs have the first joint produced rather deeper than the preceding; it is irregularly serrated the whole length of the inferior margin; the rest of the leg is long and slender, and furnished with many long hairs: the finger is long and powerful. The fourth pair of limbs have the first joint deeper than the preceding, not serrated along the inferior margin, but furnished with a row of solitary equidistant short hairs planted within the margin; the posterior margin is excavated near the upper edge to receive the anterior lobe of the coxa of the succeeding pair of legs. The rest of the organ is similar to that of the first pair. The fifth pair have the first joint bilobed and the second joint ovately dilated. The two posterior pairs resemble the fifth. The caudal appendages are



styliform, the antepenultimate and ultimate pairs having their branches unequal and tipped with a few small spines. The terminal piece is pointed at the tip.

The colour of the animal when fresh was pale straw, thickly blotched with rose-coloured patches over the body, and the coxæ were colourless and very transparent.

The animal was taken by us from some trawl-refuse brought from near the Eddystone Lighthouse, and is very elegant in its appearance.

We are not able to give the precise size, since unfortunately the only specimen which we have seen has not been preserved; but to the best of our recollection, the animal is about the eighth of an inch in length.

We would also offer this as a reason for suggesting some reservation as to the exact correctness of the details of the description; the figure was, however, taken from the animal when it was quite fresh, but it was lost before it could be examined more minutely.

We have sometimes, indeed, thought it possible that the limb described and figured as one of the first pair of legs may be the extremity of one of the third pair of limbs accidentally thrown forwards, in which case the first pair of limbs may be subchelate, and if so, the animal must take its place as a species of *Montagua*, notwithstanding the reduced size of the fourth, and the enlarged dimensions of the succeeding coxæ.

With these causes for doubt on our mind, we determined on the specific name.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.

Subfamily—LYSIANASSIDES.

Superior antennæ very short, with the base dilated and suddenly tapering. Coxæ of the four anterior pairs of appendages very deep, the fourth not broader than the preceding. One pair of gnathopoda very slender, and imperfectly developed.

In this subfamily the animals may readily be distinguished by their general form. They are not much compressed, but the anterior coxæ are deep enough to hide the limbs attached to them. The superior antennæ are always very short and pyriform, the shortness commonly resulting from the second and third joints of the peduncle being almost rudimentary, while the flagellum is seldom longer than the peduncle. The first or second pair of limbs are generally short and strong, whilst the other is slender and feeble. In some genera it is the first, whilst in others it is the second, which is strong. We therefore propose to divide them into—

a. Those genera which have the first pair of limbs robust, and the second pair feeble.

b. Those that have the first pair of limbs slender, and the second strong.

AMPHIPODA
NATATORIA.

LYSIANASSIDES.

a. *First pair of gnathopoda strong; second pair feeble and imperfectly cheliform.*

Genus—LYSIANASSA.

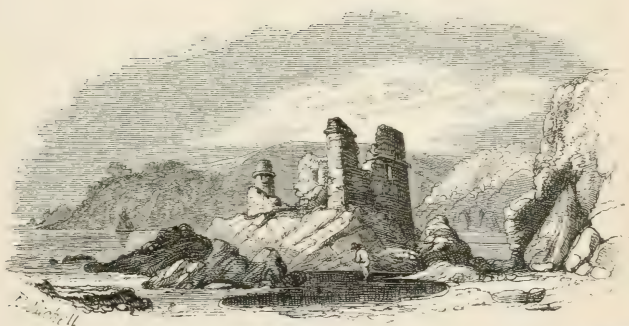
Lysianassa, EDWARDS, Ann. des Sc. Nat. t. xx. Hist. des Crust. t. iii.
p. 20. DANA, U. S. Explor. Exped. p. 908. *

Generic character. Superior antennæ very short, stouter than the inferior, appendiculate. First pair of gnathopoda not subcheliform. Second pair imperfectly developed, but long, membranous, and subchelate. Telson single, squamiform, entire.

THIS genus may be distinguished by its short upper antennæ being very stout near the head, and suddenly reduced in size at the base of the flagellum, which is very short, and carries a secondary appendage. The inferior antennæ are more slender and often longer than the superior. The mandibles are furnished with a jointed appendage, and armed with a sharp, smooth, cutting edge, carrying a stout tubercle upon the anterior margin. The pair of foot-jaws have large squamous processes attached to the third and fourth joints. The first pair of limbs are not formed into a claw, but terminate in a straight finger, which imperfectly bends upon the hand. The second pair are feeble and very long: this latter circumstance is due to the great length of the third joint, which, in most of the animals of this Order, is very short. The coxæ of the four anterior pairs of limbs are deeper than the segments of the body to

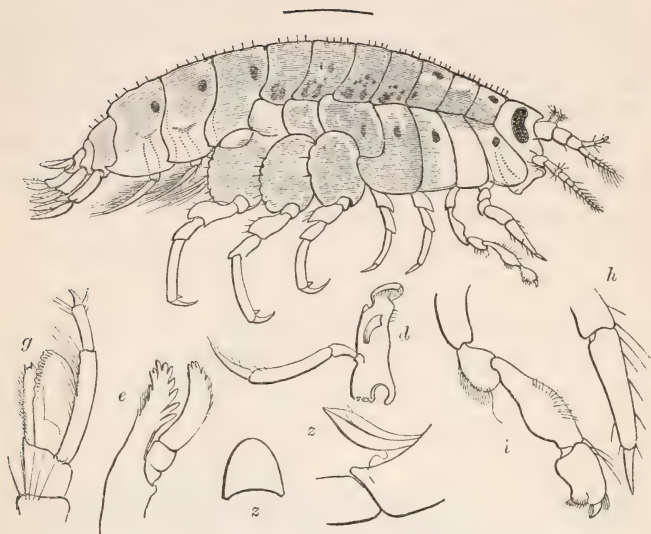
which they are respectively attached; whilst the three posterior pairs of coxæ are much shorter than the preceding. The legs are all subequal in length. The caudal appendages are short, the posterior, as well as the two preceding pairs, terminating in two branches. The middle tail-piece is single, squamiform, and entire.

The vignette below represents Salcombe Harbour, Montagu's favourite hunting-ground, from a sketch by Mr. P. Mitchell, of Plymouth,



AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



LYSIANASSA COSTÆ.

Specific character. Inferior antennæ not longer than the superior, the flagellum of each being shorter than their respective peduncles.

Length $\frac{7}{20}$ of an inch.

- Lysianassa Costæ*, EDWARDS, Ann. des Sc. Nat. t. xx. p. 365. pl. x. fig. 17.
 Hist. des Crust. t. iii. p. 21. SPENCE BATE, Report
 Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. (1857) xix.
 138. Cat. Amphipoda, Brit. Mus. p. 69. pl. x. fig.
 11. WHITE, Pop. Hist. Brit. Crust. p. 167.
Gammarus glaber, (Spinola MS.) WHITE, Cat. Brit. Mus. (Crustacea), 1847.

THE eyes are reniform, of a brown colour, and moderately large. The superior antennæ are not longer than the head and the first two segments of the body, while the peduncle is scarcely longer than the head, and the flagellum scarcely as long as the peduncle, the former consisting of six or seven articuli, and the secondary

appendage of only two. The inferior antennæ do not reach beyond the extremity of the superior; they are much more slender, and have a considerable portion of the peduncle covered by the lateral walls of the head. The epistoma considerably projects, and is formed into a wedge-like process, rounded and projecting above, receding towards the inferior margin, where it corresponds with the lower extremity or cutting margin of the mandibles.

The mandibles, *d*, are long and narrow, narrower a little towards the cutting margins than at the base, which articulates with the head; the molar tubercle is long, narrow, and slightly curved: the incisive margin is smooth, a form which, as far as we are aware, is peculiar to this subfamily, and suggests the idea of its being adapted for cutting vegetable substances; the blade is hollow, or cup-shaped, being separated from the remainder of the mandible by a sudden constriction or neck; the anterior margin, where it is increased in width, is produced into a small tubercle; the mandibular appendage is three-jointed, which is a very common form in the Order. The pair of foot-jaws, *g*, have the fifth joint very long, being much longer than the sixth. The third and fourth joints are produced into large squamiform plates, which nearly reach to the extremity of the fifth joint; the inner margin of the squamous plate of the fourth joint is slightly scalloped, and furnished with rudimentary spinules which respectively correspond with the scollops at the margin of the plate. These spinules, although of a very obsolete character, appear to differ very considerably in different species; and we think that they may be found of very considerable service in detecting the relative value of species, where it may be desirable

to ascertain that circumstance from specimens in which the more prominent features have been lost. The two anterior pairs of limbs bear an affinity to those of the genus *Talitrus*. The first pair are strong and robust, having the finger sharp and straight, and incapable of being inflexed upon the hand, which is of considerable length, and gradually tapering to its extremity, where it is not broader than the base of the finger: the coxa of this pair of limbs is very thin and transparent, projecting so far anteriorly that (when the head is bent downwards) it covers all but the last joint of the peduncle of the inferior antennæ, which is clearly seen through it. The second pair of limbs are much longer than the first; they are exceedingly thin and slender, and exhibit, in a marked degree, the peculiarity of the genus, in having the third joint remarkably long: the wrist also is very long, being much longer than the hand, which is very short, and furnished with a very short finger, so that the organ can but be of little value in grasping or securing any object of prey, a circumstance which would again suggest to us the habits of a vegetable rather than a carnivorous feeder. The third and fourth pairs of limbs are similar in form, except that the coxa of the fourth pair has a deep emargination for the reception of the anterior lobe of the coxa of the fifth pair. The three posterior pairs are also formed upon a uniform plan, and scarcely differ in length; the posterior margins of the broad squamiform plates of the second joints are scalloped, a small hair springing from the depression formed by each scallop. The caudal appendages are short, and in general form approximate those of leaping rather than those of swimming amphipoda. The penultimate pair are shorter than either the preceding or the following; they all have their branches

shorter than their peduncles, and are naked, being unfurnished with either spines or hairs. The middle tail-scale is round at the apex, squamiform, superiorly concave, and furnished subapically on each margin with one solitary cilium. The structure of the skin, as viewed beneath the microscope, shows but a number of minute granules scattered thickly over the texture, while minute cilia are seen to spring upright from its surface.

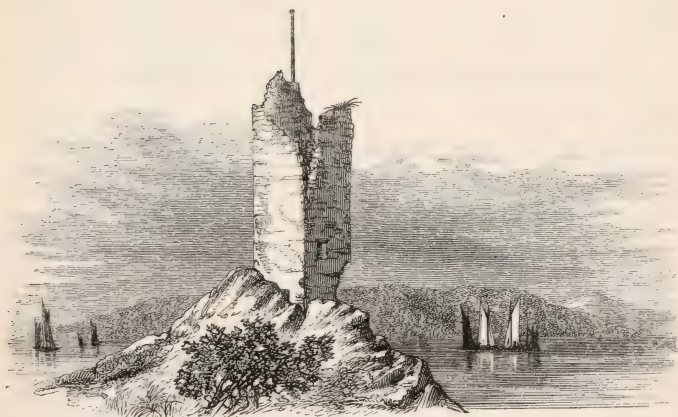
The animal is sometimes very transparent, verging to a gray along the dorsal surface, where each segment is marked with a white patch. The anterior portion of the body is tinted with yellowish brown, and one or more spots of the same colour exist upon each segment, and on some of the coxæ.

We have received specimens from Tenby, where it was dredged by our friend Mr. Webster, to whom we are indebted for Crustacea from many different localities. Mr. Alder has taken a single specimen on the coast of Northumberland. We have also taken it at Plymouth, and found it amongst Mr. Thompson's Collection of Amphipoda, marked as having been taken at Belfast by Mr. Hyndman.

The original specimen named by Prof. Milne-Edwards is still preserved in the Collection of the Jardin des Plantes at Paris, and through his courtesy and kindness we have been able to examine and compare it with the British form. The type was taken at Naples. The specimen in the British Museum, presented by the Marquis Spinola, under the name of *Gammarus glaber*, unquestionably belongs to this species. Specimens also which answer to the description of this species have been taken at Sukkertopper, near Greenland, in forty fathoms by Mr. Holböll. The form appears to be repeated in several parts of the world; for the species

L. nasuta of Dana, taken on the coast of Brazil, and *L. variegata*, taken by Mr. Stimpson in Simon's Bay, Cape of Good Hope, except, perhaps, in size, can with difficulty be distinguished from this species. *L. Magellanica* of Edwards, brought from the southern extremity of South America by M. D'Orbigny, also bears to it a close general affinity, but differs materially in size: the British species being probably the smallest of the genus, whilst the Magellan form is the largest, and probably also the largest known normal Amphipod, being about three inches in length, forming a fit companion to *Uristes gigas* of Dana, and *Cystosoma* of Guerin.

The accompanying vignette of Audleyn Castle, on the coast of Co. Down, Ireland, was kindly sketched for us by Mrs. Campbell, of Stoke, Plymouth.



AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



LYSIANASSA AUDOUINIANA.

Specific character. Inferior antennæ shorter than the superior, having the flagellum almost rudimentary.

Length, $\frac{7}{10}$ of an inch.

Lysianassa Audouiniana, SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. (1857) xix. 138. Cat. Amph. Brit. Mus. p. 69, pl. xi. fig. 1. WHITE, Pop. Hist. Brit. Crust. p. 168.

THE head is very short and very deep, having a large space between the superior and inferior antennæ; the ophthalmic lobe is not prominent, and the inferior margin is produced downwards. The eyes are large, oblong, slightly waved, broader below than above, white, marked with black spots, the latter, on close observation, being apparently caused by a series of hollows in the white surface, the black being seen through the perforations. The superior antennæ are

as long as the head and first segment of the body; the peduncle is longer than the flagellum, and the first joint longer than the other two, the third being shorter than the second. The flagellum consists of four articuli, the first of which supports a brush of hairs, or rather one or two short rows of auditory cilia—long, delicate membranous organisms, somewhat like transparent hairs, and evidently intimately connected with the sensation of hearing; the secondary appendage is minute and slender, consisting of two articuli only, one much longer than the other. The first pair of legs are short, and have the coxa but little developed; the hand is tapering, and furnished with two hairs near the base of the finger; the finger is slightly curved, terminating in a short nail, and armed along the inferior margin with two minute spinules. The second pair of legs are long and slender, having the coxa deeper than that of the preceding pair; the wrist is nearly as long again as the hand, and has the inferior margin thickly ciliated with long hairs; the hand is not broader than the wrist, and has the upper and lower margins nearly parallel, and thickly furnished with long hairs; the inferior angle is considerably produced, so as to give to the organ a chelate character, although, from its minute dimensions, one of feeble importance. The finger is straight and tapering, having the apex subapically furnished externally with a curved spine. The third and fourth pairs of legs are subequal, tolerably robust, and alike, except in the form of their coxæ, which is much larger in the fourth than in the third pair, and has a slight emargination, corresponding with the margin of the anterior lobe of the coxa of the fifth pair of legs. The three posterior pairs of legs are also of the same length and form, tolerably strong, though not so robust as the two preceding; their second joints are

oblong-ovate, and have the posterior margin simple. The caudal appendages are simple: the antepenultimate pair have the branches styliform, naked, slightly curved, and tipped with a rudimentary spine; the penultimate resemble the preceding, except that the posterior margin of each branch has its distal moiety minutely serrated. The ultimate pair have the base very short, and one branch simple, the other two-jointed and tipped with a minute spine; the inner margin of the single-jointed branch, and the first joint of the double-jointed one, are minutely serrated. The central tail-piece is simple, squamiform, concave above, and rounded at the apex.

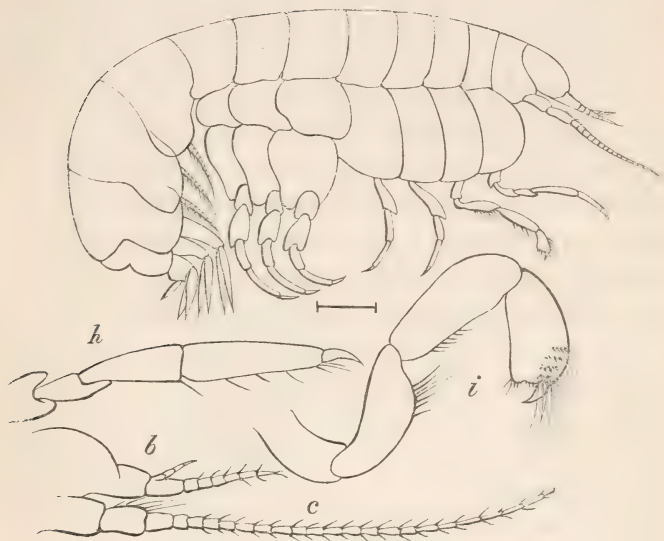
The animal is of a dull yellow colour, darkest along the course of the alimentary canal.

This species has been taken by us, in Plymouth Sound, with a dredge; but we have not noticed it among those Crustacea sent to us by our many obliging correspondents from other localities.

The species is named in honour of M. Audouin, the able coadjutor of M. Milne-Edwards, and who, as the describer of the Amphipoda in Savigny's "Egypt," must be reckoned among the pioneers of this branch of Carcinology.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



LYSIANASSA ATLANTICA.

Specific character. Inferior antennæ as long again as the superior.
Length $\frac{6}{20}$ of an inch.

- Gammarus Atlanticus.* MILNE-EDWARDS, Ann. des Sc. Nat. t. xx.
Lysianassa Atlantica. MILNE-EDWARDS, Hist. des Crust. t. iii. p. 22.
 SPENCE BATE, Cat. Amph. Brit. Mus. p. 68,
 pl. x. fig. 10.
Lysianassa marina. SPENCE BATE, Ann. Nat. Hist. v. xix. p. 138 (1857).
 WHITE, Pop. Hist. Brit. Crust. p. 168.
Opis typica. WHITE, Pop. Hist. Brit. Crust. p. 168. Cat. Crust.
 Brit. Mus. 1850, p. 49 (but not of Kroyer, Nat.
 Tidsk. iv. 149, Voy. Scandin. tab. 17, fig. 1.)

THE superior pair of antennæ are not longer than the head and first two segments. They have the first joint of the peduncle very large; the upper margin is continuous with the upper line of the head, and suddenly curved down towards the distal extremity—a circumstance

that, at the first glance, gives it the appearance of being the anterior extremity of the head ; the second and third joints overlap each other, and are reduced in length to the limits of very short joints, and not half as broad as the first. The flagellum is not so long as the peduncle : it consists of seven articuli, of which the first is longer than the two last joints of the peduncle together ; the rest, together, are as long again as the first. The inferior antennæ are as long again as the superior, and much more slender. The peduncle does not reach beyond the peduncle of the superior ; the flagellum consists of about twenty-one or twenty-two articuli, of which the first is as long as the two following ; each articulus carries one or two minute hairs ; but the inferior, as well as the superior pair of antennæ are very free from any appearance of cilia. The organs of the mouth are hid by the lateral appendages. The first pair of legs have the coxa deeper than the segment to which it is attached, the other joints are long and slender, the wrist is continuous with, and as long as, the hand : it increases in diameter until it meets the posterior extremity of the hand, which is its broadest part ; the hand is there also at its broadest diameter, from which it gradually tapers to the distal extremity, where it supports a short, slightly-curved finger. The second pair of legs are a little longer than the first ; the coxa is deeper than the second segment ; the wrist is longer than the hand ; the hand is but little broader than the wrist, upper margin arcuate, inferior straight, palm very short, truncate, fringed with short cilia, and defined from the inferior margin by a right angle. The distal half of the upper margin is fringed with several rows of long hairs. The perambulatory legs are subequal in length ; the two anterior pairs (or the third and fourth pairs of legs)

have the coxæ deeper than the respective segments to which they are attached. The coxæ of the fourth pair have an emargination that extends more than half its depth, for the reception of the anterior margin of the coxæ of the fifth pair of legs. The remaining joints of the first two pairs are uniform. The three posterior pairs are also conjointly uniform; their coxæ are shorter than their respective segments of the body; the second joints have the squamous plates broader above than below, and are postero-inferiorly produced, so as almost to reach to the distal extremity of the third joint; the fourth joint is somewhat dilated, the wrists are short, the feet longer than the wrists, the fingers are short and pointed. The caudal appendages are subequal, the posterior pair being rather the shortest. The middle tail-piece is as long as the branches of the posterior pair of the caudal appendages. It is squamous and simple.

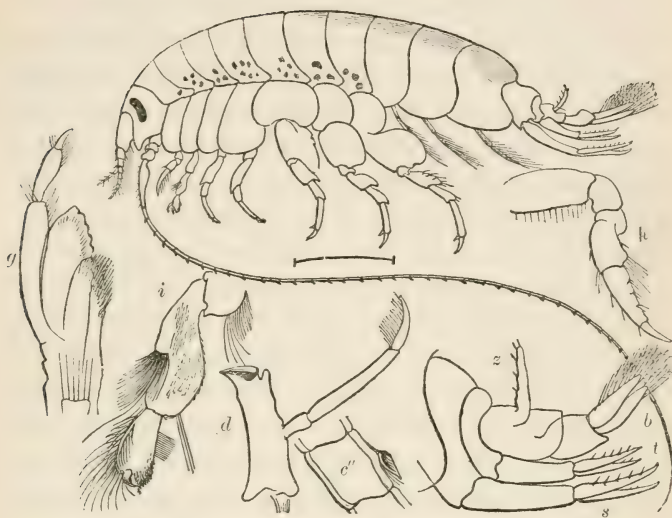
We dredged the first specimen of this species in Plymouth Sound, and described it under the name of *L. marina*. We have also received it from one of our most valued correspondents, Mr. Edward, of Banff, who took it in the neighbourhood in which he resides; and Mr. W. Thompson has found it in Strangford Loch, Ireland.

Since the publication of the "Synopsis of the British Amphipoda," we have had the opportunity of examining the type of M. Milne-Edwards' species, *L. Atlantica*, preserved in the Museum of the Jardin des Plantes, and are thereby enabled to identify the British species with that taken in the Atlantic Ocean.

This species, like *L. Costæ*, appears to be represented, by close resemblance of form, by species existing in distant localities, of which *L. Kroyeri*, from Van Dieman's Land, is an example.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



LYSIANASSA LONGICORNIS.

Specific character. Inferior antennæ longer than the animal in the male, but a little shorter in the female.

Length $\frac{1}{2}$ in.

Lysianassa longicornis. LUCAS, Expl. Sci. Algerie Zool. i. Crust. p. 53, pl. 5, fig. 2. SPENCE BATE, Cat. Amph. Brit. Mus. p. 70, pl. xi. fig. 2. Ann. Nat. Hist. 2nd Ser. xx. p. 525 (Jan. 1858.)

Lysianassa Chausica. SPENCE BATE, Ann. Nat. Hist. (1857) v. xix. p. 138. WHITE, Pop. Hist. Brit. Crust. p. 168, (not *Alibrotus Chausicus* M.-Edwards' Hist. Crust. iii. 23.)

THE head has the lobes between the antennæ produced to a somewhat down-curved point, extending further forwards than the upper extremity of the head, and extending beyond the basal half of the first joint of the peduncle of the upper antennæ. The back is long and smooth; but the three last joints of the tail are suddenly

lessened in diameter. The eyes are moderately large, somewhat reniform, and of a black colour. The upper antennæ are equal in length to the head and first two segments of the body taken together; the peduncle has the first joint as long as the upper margin of the head, the second and third joints are successively shorter; the flagellum, which consists of six or seven articuli, is shorter than the peduncle, but the secondary appendage is nearly as long, though much more slender, than the peduncle. The lower antennæ have the peduncle as long as the upper organs; the first four joints are very short, but the fifth reaches to the extremity of the upper antennæ; it is of a peculiar shape—narrow near the base, it suddenly enlarges, leaving a hollow upon the lower margin, that enables the antennæ at this joint to be reflected back upon itself, and thus the organ is carried, close pressed beneath the body of the animal, which is its usual position; from the widest diameter, which is at the extremity of this hollow or notch, the joint gradually tapers to the apex. The flagellum is very slender and long, reaching much beyond the extremity of the animal. Each articulus of the flagellum is a little longer than broad, and carries upon the upper margin, which is slightly raised near the centre for that purpose, a small membranous vesicle, in form like an inverted shoe, from which resemblance Mr. Stimpson, the naturalist of the United States' Expedition to Japan, has given it the name *Calceola*. The use of these organisms is not known; Mr. Stimpson has, however, informed us that they are peculiar to the males; whilst our experience tells us that they are not common to the males of all Amphipoda, nor, in fact, to those of this genus; neither do they appear to be so common to species which belong to the British seas as to exotic forms.

Believing that the inferior antennæ are organs adapted for the sense of smell, we may conjecture that these membranous attachments have the power of increasing that faculty to a more acute degree. The fact of their being found in the males only would seem to corroborate this supposition, since undoubtedly the males seek the other sex by the use of this sense, as the following experiment appears to demonstrate. Having separated a male amphipod from a female, which he was carrying about with his legs, the latter immediately swam to a place of security, but the male dashed eagerly round the trough in which they were confined. While swimming about, however, we observed that, having passed by his mate, he would turn back, and select her from among several others. We think that this could only have been performed by the agency of smell, and therefore consider these calceola as organisms, connected with and increasing the capability of that sense in the male amphipods where they exist.

The epistoma projects in a narrow perpendicular wedge-like process, with a rounded apex, over which the inferior antennæ bend.

The mandibles do not materially differ from those of species of this genus previously described. The foot-jaws have the fifth joint very long, nearly three times as long as the sixth, and have squamous plates attached to the third and fourth joints; the plate belonging to the fourth joint has the outer margin minutely waved, and furnished with a submarginal row of minute cilia, that of the third joint reaches to half the length of the fourth, and is furnished towards the distal extremity with a thick brush of cilia. The first pair of legs are short and tolerably robust; the wrist is about half the length of the hand and stouter; the hand from its articulation with

the wrist gradually tapers to the distal extremity, where it supports a short straight finger. The appendage is but scantily clothed with hairs. The second pair of legs are long and slender, having the wrist twice as long as the hand, with the inferior margin convex and the superior straight, the widest part being near the middle of the joint; the hand gradually but slightly increases in diameter to the extremity, where the inferior angle is produced in advance of the palm, and thus gives the part a nearer approximation to a chelate organ than is common in this order of Crustacea. The upper margin of the hand to the apex is thickly furnished with long double-branched hairs, the lower margin is studded with straight parallel hairs, and the inferior angle covered with short thick spines or obtuse hairs, very minute. The finger articulates near the centre of the extremity of the hand, and is short, sharp-pointed, and curved. The walking legs are subequal, and do not materially differ from those of other species of this genus. The two penultimate pairs of caudal appendages are styliform, and have the branches subequal in length, the upper margins being furnished with a few short hairs. The last pair reaches much further posteriorly than the two preceding, but the basal joint is very short, while the branches are long, subequal, and thickly furnished with long plumose cilia. The central tail-piece exhibits no peculiar character.

The colour of the animal, when fresh taken, was bright orange, mottled with red spots along the sides of the body, just above the legs. The specimen from which our drawing is taken was dredged by us in Plymouth Sound, and described under the name of *Lysianassa chausica*, being under the impression that it agreed with Edwards' description of *Alibrotus chausicus*; but through the kindness of the authorities at the British Museum,

our attention was drawn to a species resembling this in Lucas' Description of Crustacea taken on the shores of Algeria; since which time we have had the opportunity, through the kindness of M. Lucas (who permitted us to examine the Crustacea in his private collection), of identifying the present specimen with that taken by him on the northern coast of Africa.

Among the Crustacea forwarded to us by that obliging and indefatigable naturalist, Mr. Edward, of Banff, we have found a portion of an animal of this species from the Moray Frith. We are also indebted to Professor Kinahan, of Dublin, for several specimens from Dublin Bay. All the specimens from the last-named locality have the lower antennæ shorter than that given in our description and figure of the species, and do not possess the calceola attached to the same appendage—circumstances which have induced us to conclude that these were female specimens.



AMPHIPODA.
NATATORIA.

LYSIANASSIDES.

Genus—ANONYX, KROYER.

Anonyx Kroyer. GRÖNLAND, Amfip. p. 15 ; Nat. Tidsk. v. ii. p. 256.

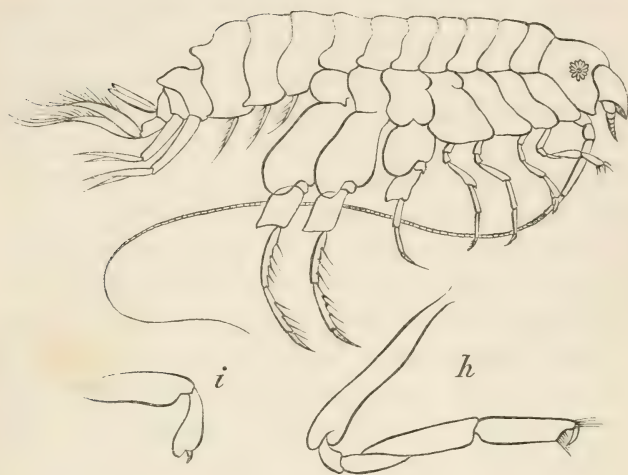
Generic character.—Superior antennæ short, pyriform, furnished with a secondary appendage. Mandibles having a smooth incisive margin and a palpi-form appendage. First pair of gnathopoda subchelate ; second pair long, slender, feeble, and subchelate. Telson single, squamiform, cleft.

THIS genus was separated from *Lysianassa* by Kroyer, from the subchelate form of the hands of the third pair of limbs (“*parvulo instructi ungue*”), and from the fourth pair of limbs being destitute of a terminal hook, (whence the generic name,) the place of which is supplied by a brush of hairs. Also the middle tail-piece, instead of being entire, as in *Lysianassa*, is divided more or less deeply in *Anonyx*. Neither of these characters are capable of being distinguished without close examination, and in some species, *Anonyx lagena* for example, the extremely oblique palm of the hand approximates, in its form, to that of a *Lysianassa* ; again, the division of the central tail-piece is occasionally so slight, as in *A. obesa*, that a small depression alone exists. The genus *Opis*, of which Kroyer has described two species, differs from *Anonyx* in the opposite extreme. As *Lysianassa* has a less perfectly chelate hand than *Anonyx*, so *Opis* possesses one that is still more perfect as a didactyle claw.

This grouping, although convenient, appears to us to be arbitrary ; moreover, it is not improbable that some of the forms may be only sexual.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX LONGICORNIS.

Specific character. Central dorsal line slightly carinated. Third segment of the pleon tuberculated at the posterior dorsal margin. Inferior antennæ longer than the animal. Telson very long and deeply cleft.

Length $\frac{1}{2}$ in.

Anonyx longicornis. SPENCE BATE, Cat. Amph. Brit. Mus. p. 72, pl. xi. fig. 4.

THIS animal in its general form differs considerably from the type of the genus, which is round and smooth, while this puts on an angulated appearance. The head is produced a little in front, the back is slightly carinated through the entire length of the animal, the tenth segment (N) of the body is posteriorly produced to a tubercle, and a deep sinus indents the anterior dorsal portion of the next, which is also posteriorly elevated into a long tubercular ridge.

The eyes are small and oval; they appear smaller than they really are, for the black pigment is only visible in the centre of the organ, the several lenses forming an areola round the central spot. The superior antennæ are short. The first joint of the peduncle is as long as the head, and has the upper margin produced anteriorly so far that it reaches to the extremity of the third joint. The second and third joints are short and small, and gradually taper to the extremity of the flagellum, which consists of but two or three articuli. We have not observed the secondary appendage. The inferior antennæ are long, longer than the entire animal, and very slender. They bear a considerable resemblance to the same organ in *Lysianassa longicornis*. The third and fourth joints of the peduncle are short, being as broad as long; the fifth or last joint is very long, hollowed upon the under side near the base, swelled near the middle, and gradually tapering to the distal extremity; the flagellum is very slender and long, and is formed of articuli which are long and slender, every articulus being furnished with a calceola—a fact, which, if Stimpson be correct, shows that our specimen is a male animal. The first pair of legs are long and slender, having the wrist longer than the hand, and the under margin parallel with the upper; the hand is not broader than the wrist, and also has the under margin parallel with the upper, the palm is short, oblique, and concave. The second pair of legs are long, slender, and membranaceous; the wrist is longer than the hand; the hand has the infero-anterior angle produced to a blunt point beyond the palm, equal to the length of the finger, which is very short, and therefore approximates nearly to a didactyle claw. The first two pairs of walking legs are slender. The last three have the

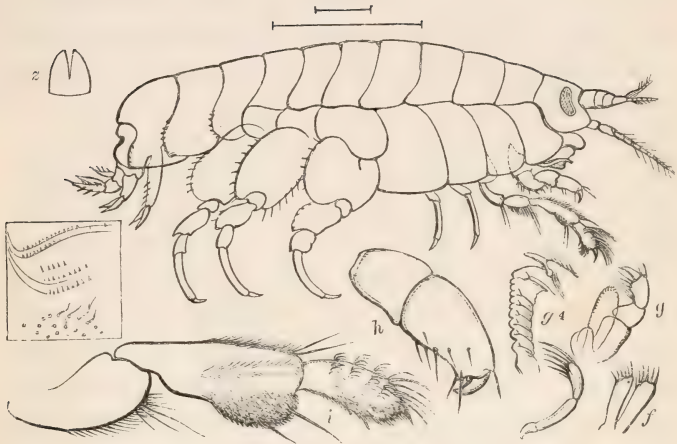
second or squamose joint posteriorly and inferiorly produced, so as to cover the third joint and part of the fourth: the fourth joint is very peculiar, being posteriorly developed to a squamose plate, with the upper and lower margins posteriorly depressed, and almost parallel, as are also the anterior and posterior margins—circumstances that give to the joint the form of a diagonal parallelogram. The wrist is very long, longer than the hand, and stouter; the hands have the margins parallel; fingers long, slender, and straight. The two posterior pairs of legs are subequal, and considerably longer than the preceding. The caudal appendages are subequal in length; the two anterior pairs are free from hairs or spines, and reach to the same distance, the branches being equal. The posterior pair have the branches equal to each other in length, but a little longer than those of the two preceding pairs; they have the inferior margin straight, or nearly so, tending rather to a hollow than to a convex outline, while the upper margin is arcuate, and furnished with a thick fringe of hairs. The terminal plate is very long, reaching to two-thirds the length of the posterior pair of caudal appendages.

We received this interesting specimen from our valued friend and correspondent, Mr. Geo. Barlee. He obtained it, with many other Crustacea, from the Haaf fishing-grounds off the coast of Shetland.



AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX EDWARDSI.

Specific character. Inferior antennæ scarcely longer than the superior. First pair of gnathopoda short, robust, having the propodos broader near the carpal extremity than at the palm. Palm but slightly oblique, defined by an almost right angle.

Length $\frac{5}{20}$ of an inch.

Anonyx Edwardsi. KROYER, Voyage en Scand. pl. xvi. fig. 2. BRANDT, Middendorff's Siberische Reise, pl. xi. fig. 7. LILJEBORG, in Ofvers. af Kongl. Vetensk. Akad. Forhandl. 1851, No. 38. WHITE, Pop. Hist. Brit. Crust. p. 170, pl. x. fig. 3. SPENCE BATE, Ann. Nat. Hist. xix. p. 138 (1857); Cat. Amph. Brit. Mus. p. 73. pl. xi. fig. 5.

THIS animal bears a general resemblance to *Lysianassa Costæ*. It has a sinus in the middle of the antepenultimate segment of the body. The eyes are subreniform, and of a white colour covered with black spots. The superior antennæ have the peduncle as long as the head,

the second and third joints suddenly narrowing, giving to the upper margin an arcuate line, while the lower is straight; the flagellum is about the same length as the peduncle, the first articulus being nearly half its entire length. The secondary appendage is nearly as long as the flagellum. The inferior antennæ are about the same length as the superior; the joints forming the peduncle are short, except the last, being hidden behind the projecting lateral lobes of the head. The epistoma is rounded in front, and projects as far in advance as the frontal wall of the head. The foot-jaws are short, and have the fifth and sixth joints subequal in length, but neither of them are much longer than the seventh. The plate which is attached to the fourth joint has the inner margin crenulated, where the rudiments of a spine corresponds with each lobule; a single strong spine subapically crowns the plate. The first pair of legs are short and robust, they have the wrist and hand nearly of the same length, and continuous with each other, forming a long imperfect ellipse, the broadest part of which corresponds with the articulation between the two joints. The palm is the narrowest part of the hand; it is smooth, and defined by a right angle that projects a little beyond the regular line of the inferior margin: the finger is short, strong, and curved. The second pair of legs are long and slender, having the third joint nearly as long as the fourth, the fifth much longer than either, and as long again as the hand, it is inferiorly produced to a lobe, which is thickly covered with a fur of short stiff hairs, above which, on the inner side as well as on the upper margin, is a double row of similar hairs which extend longitudinally along half the length of the joint. The hand is rounded at the apex, furnished with five rows of hairs

running across the axis of the joint, and covered below and at the apex with a fur of short hairs, amongst which the small finger is lost to observation, except under very high magnifying power. It must therefore appear, if there be any prehensile capability in this and other similar appendages, that it is not obtained through any assistance that can be derived from the finger, but by the pressure of the hand back against the hairy cushion on the inferior surface of the wrist. The first two pairs of walking legs are small, and the last three appear to be more robust; they are rather curved, and have the second joint developed to a broad oval shape, which is produced infero-posteriorly, so far as to cover the next joint; their posterior margins are crenulated, and have a short hair springing from the depression between each lobule; the fourth joint is broader in the fifth pair of legs than in the two following pairs; the sixth joint is slightly curved, the two margins being parallel. The three pairs of caudal appendages are short; the branches (which are of equal length on each) are very short, those on the posterior being a little the longest. The terminal scale is cleft through more than half its length. The tail generally has the appearance of being a powerfully thrusting organ, and it is undoubtedly used to propel the animal either backwards or forwards.

The colour of the animal varies from a transparent pale yellow, in the young state, to that of a deep yellow or light brown tint. The eyes are red in the young, but become black in the adult animal. The structure of the skin appears not to exhibit any decided markings when examined by the microscope, but the surface generally is covered with minute solitary spinules or short hairs, distantly scattered.

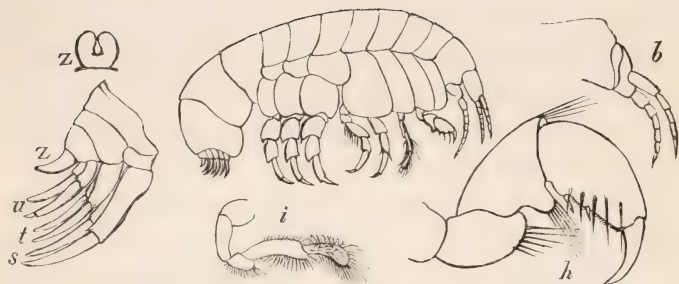
This description, as well as our figure, is taken from a

British specimen. On comparing it with Kroyer's figure in his magnificent work cited above, the following differences will be found. Kroyer represents the palm of the first hand as serrated, as also the inner margin of the finger. The serrature is, however, not deep, and we do not think that we should be justified in making a separate species upon characters so trivial, unsupported by other characters. We have also observed a slightly-serrated margin in some specimens.

We have received specimens of this species from the Moray Frith, sent to us by the Rev. Geo. Gordon, and Mr. Edward, of Banff, who has forwarded to us the largest specimen that we have seen. From Falmouth it has been sent us by Mr. Webster; and we have dredged it in Plymouth Sound.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX OBESUS.

Specific character.—Three posterior segments of the pleon very short. Superior antennæ having the secondary appendage as long as the primary. Inferior antennæ scarcely longer than the superior. First pair of gnathopoda having the propodos ovate, tapering, palm continuous with the inferior margin, and but slightly defined. Telson bilobed.

Length $\frac{1}{4}$ inch.

Anonyx obesus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 74, pl. xii. fig. 1.

THE animal is short, round, and obese, (whence its specific name has been derived,) and the tail extends but slightly beyond the last deep segment of the body. The eyes were not visible in the specimen which we have seen, which was sent to us preserved in spirits. The superior antennæ are rather longer than the head. The first joint of the peduncle is very large, the second and third short, the flagellum articulates with the peduncle upon a process of the third joint, and consists of six or seven articuli, the first of which is rather larger than the others. The secondary appendage is as long as the primary; it originates in a depression immediately above the articulation of the flagellum, and consists of

five or six articuli, each of which is respectively longer than the articuli of the flagellum, and the first is more than as long again as either of the others. The inferior antennæ are scarcely longer than the superior. The first pair of legs are very robust; the wrist and hand together have the upper margins in form of a continuous curve; the inferior margin of the wrist is slightly produced between the preceding joint and the hand, and is crowned with several long hairs; the hand is long, ovate; the upper margin more curved than the lower; the palm is continuous with the inferior margin, and defined by a small spine planted upon a tubercle near the carpal extremity, a second spine is placed one-third in advance of the preceding; the palm is fringed with a row of very minute cilia, and laterally defended by five or six equidistant hairs; the finger is strong, curved, and sharp. The second pair of legs are long, slender, and membranaceous; the third joint is longer than the fourth, and the wrist is much longer than the hand; both these last two joints increase in diameter towards their distal extremity, and are thickly covered with short straight hairs,—those upon the hand are more numerous, and altogether prevent the finger from being observed. The walking legs are short and very strong; the last three pairs are more so than the preceding, and have the scale-like second joints almost disk-shaped; the fourth and fifth joints are also very broad, the former more so than the latter. The tail is very short. The lateral walls of the last three segments are very deep, especially those of the last joint; and when the caudal appendages are not extended they are almost covered by them, even when not rolled up. The caudal appendages are free from hairs or spines; their branches are styli-form, with a slight curve gradually tapering to a point.

The antepenultimate pair have the branches shorter than their peduncles; those of the penultimate and ultimate are longer; especially the latter, on the outer branch of which there is an articulation near the apex. The caudal plate is almost round, divided at the apex to more than half the depth of the plate, where the division is broader than at the apex, thus giving the plate the appearance of being bilobed.

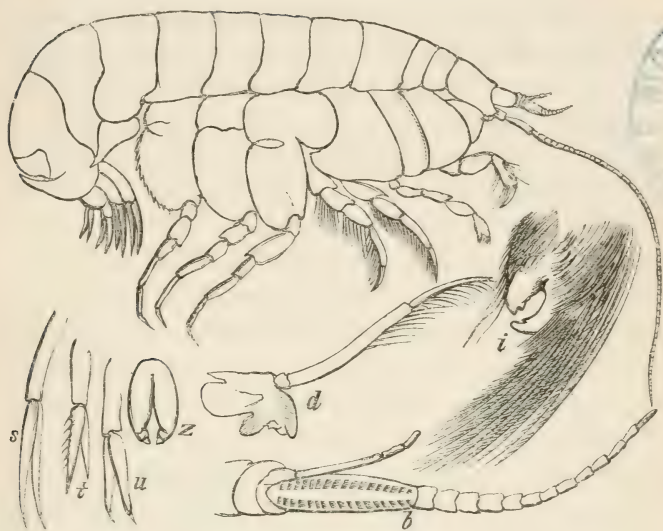
This species affords an example of the near approximation of *Anonyx* and *Lysianassa*. The first pair of hands have the palm scarcely distinguishable from the line of the inferior margin, against which the curved finger impinges when closed.

Having stated that this specimen was sent to us in spirits, we would here mention that we find, for a limited period (some months at least), specimens preserved in glycerine keep all the colour and transparency of living animals.

This species was sent to us by Mr. Edward, of Banff, who took it in the Moray Frith.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX DENTICULATUS.

Specific character.—Third segment of the pleon produced on each side into a tooth, which is directed upwards and backwards, at a right angle with the inferior half of the posterior margin. Inferior antennae more than half the length of the animal.

Length $\frac{1}{2}$ inch.

Anonyx denticulatus. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. vol. xix. 139 (Feb. 1857.) Cat. Amph. Brit. Mus. p. 74, pl. xii. fig. 2. WHITE, Pop. Hist. Brit. Crust. p. 171.

THE animal is proportionably long, and in general form bears a considerable resemblance to *Anonyx ampulla*, from which it may be readily recognized by the posterior margin of the last deep segment of the body being produced on each side backwards and upwards into a long flat tooth. The eyes in this species have not been observed by us, having only seen dead specimens. The superior

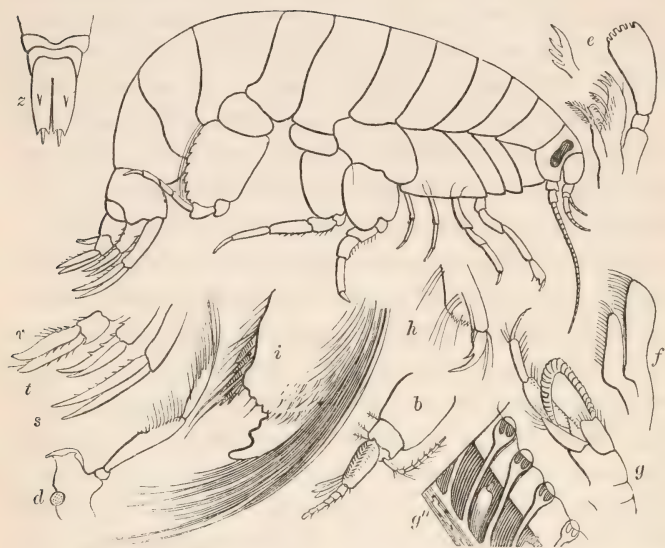
antennæ are scarcely longer than the head; the first joint of the peduncle is long, nearly as broad at the distal extremity as at the centre, and superiorly it considerably overlaps the second joint; the second joint is short, but not much narrower than the first, it also considerably overlaps the third; the third joint is very short, but longer on the internal upper margin than at the lower: the first articulus of the flagellum is as long as the peduncle, and is furnished upon the inner surface with two longitudinal series of rows of minute hairs; the rest of the articuli, about thirteen in number, are as broad as long, and inferiorly furnished upon the inner surface of each with three hairs. The secondary appendage is short, not being longer than the first articulus of the flagellum; it consists of three articuli, the first long, the other two short. The inferior antennæ are rather more than half the length of the animal; the last joint of the peduncle extends quite to the distal extremity of the first articulus of the flagellum of the superior antennæ; the flagellum is long and slender, and reaches to half the length of the animal. The epistoma is not very prominent. The mandibles have both extremities of the incisive edge produced beyond the intermediate blade; the molar tubercle is furnished with a few short obtuse spines. The appendage is long, with the second joint longer than the third. The first pair of legs are long and slender; they have the wrist and hand subequal in length, the wrist being rather broader than the hand; it has the margins parallel, and terminates abruptly; the hand has the margins parallel, the palm is oblique, convex, being formed by the apical margin gradually rounding into the inferior; it is minutely pectinated through its entire surface, and is defined only by the cessation of the small teeth; the finger is long, slender, and slightly

curved, reaching to the extremity of the palm, and, when closed, impinging against it through its entire length. The second pair of legs are long, slender, and membranaceous; the wrist is longer than the hand, and thickly furred with hair; the hand is almost oval, very hirsute, and terminating in a minute claw, which is almost lost in a brush of plumose hair at its extremity. The other legs are tolerably long and slender. The second joint of the last three pairs is oval, but not produced so as to cover any of the succeeding joints of the leg; the posterior margin is serrated, but more distinctly in the last pair than in the other two. The caudal appendages are simple, the penultimate being rather shorter than the other two. The middle tail-piece is ovate, cleft down the centre nearly to the bottom, each division being furnished at its apex with a strong blunt spinule. Some of the hairs upon the first pair of legs terminate in a trident; others have the apex reflexed, so as to assume a club-shaped appearance. The extremity of the finger also has a peculiar and probably unique feature,—the point, which is tolerably fine, is protected by a little membranous sac, which appears to be formed so that the animal can cover or expose it at will.

This species is as yet rather rare. We have received it from the Moray Frith, from our kind correspondents, the Rev. Geo. Gordon, and Mr. Edward. Professor Kinahan has sent us a single specimen from Dublin Bay; and recently it has been taken by Mr. J. Gwyn Jeffreys and the Rev. A. M. Norman, in Vedlom Voe, Shetlands.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX HOLBOLLI.

Specific character.—Eye oblong. Superior antennæ half as long as the inferior. Inferior antennæ one-fifth the length of the animal. First pair of gnathopoda having the palm oblique, minutely pectinated, and defined by two small spines.

Length $\frac{13}{20}$ inch.

Anonyx Holbolli. KROYER, Voy. Scand. Crust. pl. xv. fig. 1 a-s. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. ser. 2, xix. p. 138 (Feb. 1857.) Cat. Amph. Brit. Mus. p. 75, pl. xii. fig. 4. WHITE, Pop. Hist. Brit. Crust. p. 170. LILJEBORG, in Ofvers. af Kongl. Vetensk. Akad. Forhandl. 1851, p. 22, No. 36.

THE general form of the animal is long and smoothly round over the back, the superior antennæ appearing as a part of the head of the animal. The eyes are a long oval, assuming somewhat of the kidney shape. The colour of the organ is reddish, but in the specimens

which we have seen, the outline has been scarcely as defined as that given in our figure. In Kroyer's beautiful plates in his "*Voyage en Scandinavie*," the form is given as wedge-shaped, slightly curved, the narrow extremity being uppermost, and the broadest downwards, like an inverted comma ('). The upper antennæ have the first joint of the peduncle very long and stout, while the second is short and much narrower; the third being scarcely visible, a portion only of it extending beyond the limits of the preceding; the first articulus of the flagellum is very long, as long as all the others united, and is furnished upon the inner side with two longitudinal series of transverse rows of short hairs. It also supports at its extremity, upon the upper side, a bundle of auditory cilia; the rest of the flagellum consists of but six or seven articuli: the secondary appendage is long and slender; it is nearly as long as the flagellum, and consists of about eight articuli, of which the first is the longest.

The lower antennæ are about one-fifth the length of the animal, and as long again as those of the upper pair; the peduncle is shorter than that of the upper antennæ, and less stout; the flagellum is long and slender, and has the articuli, of which it is composed, longer than broad.

The mandibles are furnished with a plain cutting incisive edge, from near the base of which a row of minute curved hairs is continued, until they communicate, at the opposite extremity, with the molar tubercle. Each of these organs supports a very long three-jointed appendage, the second and third joints of which are furnished with hairs, increasing in length towards the distal extremity of each joint.

The foot-jaws have the scale-like plate belonging to

the fourth joint largely developed, having a row of tubercles or rudimentary spines on the interior margin, but which become developed into long, strong, and simple spines at the apex of the plate.

The first pair of legs have subcheliform hands; but in this species these organs are not very robust. The hand is not large, but long and narrow, being scarcely wider at the palm than at the extremity near the animal. The palm is oblique, slightly convex, and furnished with a row of parallel equidistant teeth, offering a comb-like arrangement upon the margin of the organ, and is defined by two double-pointed spines, situated at the inferior angle, against which the finger, which is furnished with a second tooth or point, impinges.

The second pair of legs are very long and slender; so slender as to be useless as prehensile organs, suggesting the idea of being adapted to the same purpose as the analogous imperfectly developed last pairs of legs in the section *Anomoura*, which are used for the purpose of cleaning and brushing the animal: they are plentifully covered with hairs, those upon the anterior margin of the hand being very long, while others upon the posterior margin are shorter and fewer in number. The palm is but slightly oblique, and has the margin slightly waved; the finger is small, and tuberculated near the base, it has the apex slightly curved, which, when it closes, antagonizes with a strong spine; several of these spines lie concealed amidst the brush of simple hairs on the posterior margin. All these spines, when closely examined, are found to have the side near the hand minutely serrated. The two anterior pairs of walking feet are slender: the three posterior are tolerably robust, and have the posterior margins of the second joints serrated, the last being the most perfectly so. Each of the caudal

appendages has its branches subequal; the penultimate pair are shorter than the preceding, or ultimate pairs. The terminal central piece is deeply divided, and each division has its apex truncated, and furnished with a central spine.

The colour of the animal is transparently white, having spots of rose-colour near the dorsal surface, on each side of the body, which in some specimens are less distinguishable in outline, their place being only indicated by a blush of the same colour.

The original specimen was taken at Sukker-topper, by M. Holböll, in compliment to whom Kroyer proposed the specific name adopted above. We have received specimens from our valued correspondent, the Rev. Geo. Gordon, of Elgin; also from our indefatigable friend, Mr. Edward, of Banff; and Mr. Barlee has dredged it on the Haaf, about thirty miles off the Shetlands. It has been taken by the Rev. A. M. Norman and Mr. J. Gwyn Jeffreys in the outer Skerries Harbour, Shetland. Mr. Loughrin has sent us a half-grown specimen from Polperro, on the coast of Cornwall, and we have dredged it in Plymouth Sound.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX MINUTUS.

Specific character.—Inferior antennæ about one-third the length of the animal. Flagellum with the articuli broader than long, and possessing a moniliform appearance. The bases of the three posterior pairs of pereopoda extending to the distal extremity of the meros.

Length ♂ inch.

Anonyx minutus. KROYER, Voy. en Scand. pl. xviii. fig. 2. LILJEBORG, in Ofvers. Kongl. Vetensk. Akad. Forhandl. 1851, p. 22, No. 39. WHITE, Pop. Hist. Brit. Crust. p. 170. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. ser. 2. xix. p. 138 (Feb. 1857.) Cat. Amph. Brit. Mus. p. 76, pl. xii. f. 6.

THE eyes in this species are small and round. The superior antennæ are very short, and have the first joint of the peduncle as long as the dorsal margin of the head, the second short, and the third almost obsolete. The first articulus of the flagellum is as long as the remaining seven or eight short ones, and is furnished on the inner surface with two longitudinal series of transverse rows of hairs. The secondary appendage is scarcely

longer than the first articulus of the flagellum, and consists of five or six articuli, of which the first is longer than all the others. The inferior antennæ are three times as long as the superior, and about one-third the length of the animal; they have the last two joints of the peduncle short and subequal in length; the flagellum consists of many short articuli, each being rather broader than long, and united to the next by a compressed articulation, a circumstance that gives to the appendage in this species a moniliform appearance. The first pair of legs are short and tolerably robust; the lower margin of the hand is nearly parallel with the upper, being rather broader at the base than at the distal extremity; the palm is straight, and defined by an almost right angle with the inferior margin; the finger that completes the organ is short and strong. The second pair of legs are much longer than the first, as is, indeed, the case throughout the genus. The limb is very slender and membranaceous, and is mostly carried folded and compressed beneath the body of the animal; the wrist is much longer than the hand, and is inferiorly lobed, the lobes being covered with a number of small blunt triple-pointed spines, or rather plates; towards the anterior margin these plates gradually lose their complex character, and become simple spines; the hand is covered with a thick brush of short hair; those on the upper margin are planted in six or seven transverse rows; towards the extremity they become longer; the finger is short, and scarcely visible amidst the hairs among which it is planted. The first two pairs of walking legs are tolerably robust. The last three are equally so, each having the second joint (which is universally developed into a squamose form in this genus) produced downwards, so far that, in the last two

particularly, they cover the next and much of the succeeding joint of the leg. The caudal appendages are short, those of the last pair having the peduncle and branches of nearly the same length.

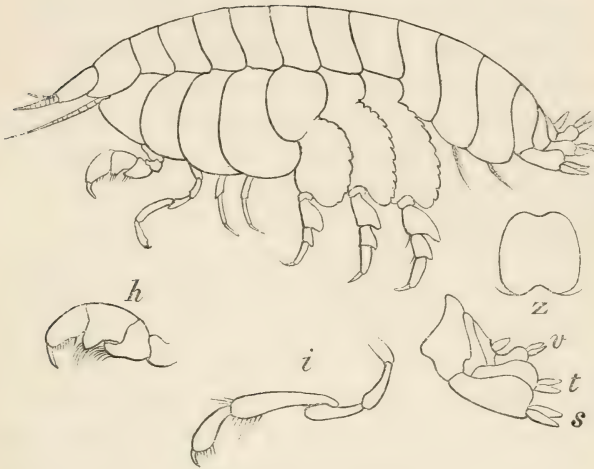
We have received specimens of this species from Strangford Loch, where it was dredged by that indefatigable naturalist, Mr. Barlee; Mr. Webster has sent it to us from Falmouth. We have also dredged it in Plymouth Sound.

The accompanying vignette is from a picture in the possession of Mrs. Hames, of Chagford.



AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX PLAUTUS.

Specific character.—Inferior antennæ scarcely longer than the superior. First pair of gnathopoda having the propodus tapering. Palm longitudinal, occupying the whole of the inferior margin.

Length $\frac{4}{20}$ inch.

Anonyx plautus. KROYER, Voy. Scand. pl. 15, fig. 2a-v. SPENCE BATE, Cat. Amph. Brit. Mus. p. 78, pl. xiii. fig. 1.

THE eyes of this species, in Kroyer's figure, are sub-reniform; in our specimen, however, we have not observed these organs.

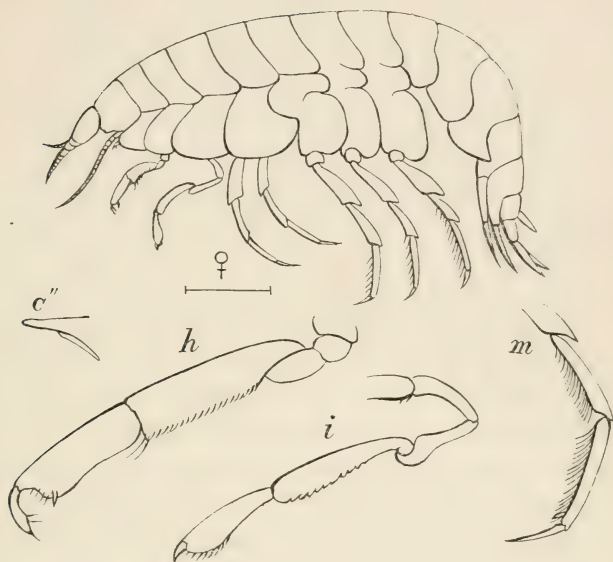
The superior antennæ are but little longer than the head; the first joint of the peduncle is as long as the head, and the second and third joints subequally short and narrow; the flagellum is scarcely as long as the peduncle; the secondary appendage is very short. The inferior antennæ are very slender, and but very little longer than the superior. The first pair of legs are

short and very robust; the fourth joint has the inferior margin considerably produced anteriorly upon the wrist; the wrist is short, very short upon the inferior margin, and arched upon the upper, forming an imperfect triangle; the hand is not so broad as the wrist, and gradually tapers to the distal extremity; the palm corresponds with the inferior margin, and is imperfectly defined; a short spine marks the limit to which the finger can reach, which corresponds nearly with the entire length of the inferior margin. The second pair of legs are long, slender, and membranaceous; the third joint is as long as the fourth; the wrist is as long again as the hand; the hand increases in width towards the distal extremity; the palm is furred with minute hairs; and the finger is very minute. The first two pairs of walking legs are tolerably slender, whilst the last three are very short and robust; the second or squamiform joint is of an oval shape, and is inferiorly produced as far as the distal extremity of the third joint, and the posterior margin is slightly crenulated. In Kroyer's figure this is not so represented, the margin being drawn smooth. The three posterior pairs of caudal appendages are short; the peduncles are stout, and increase in diameter posteriorly upon the upper margin; the branches are short, and free from hairs. The central terminal plate is round, only showing a slight depression at the apex.

The specimen from which we drew our figure and description was sent to us by Mr. Edward, of Banff, who procured it in that neighbourhood.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX LONGIPES.

Specific character. Inferior antennæ rather longer than the superior. First pair of gnathopoda having the carpus and propodos subequal, the margins parallel, palm short, slightly oblique, defined by one or two large spines near the inferior angle. Pereiopoda long and slender.

Length about $\frac{1}{2}$ inch.

Anonyx longipes. SPENCE BATE, Cat. Amph. Brit. Mus. p. 79, pl. xiii. fig. 4.

THE animal generally bears some resemblance to *A. Holbolli*, from which it differs chiefly in the form of the first pair of hands.

The eyes in this species are very small. The superior antennæ are about twice the length of the head; the first joint of the peduncle is nearly as long as the head; the next two joints are very short. The flagellum is

about the length of the peduncle; the secondary appendage is short. The inferior antennæ are very slight, and nearly half as long again as the superior. The epistoma is produced to a point. The first pair of legs are long and slender; the wrist and the hand are nearly of the same length, the wrist being slightly the longer of the two; they have the inferior margin parallel with the superior; the wrist is rather broader than the hand, and has the inferior margin furnished with a slight brush throughout its entire length; the hand has the inferior margin slightly waved; the palm is oblique, and defined by a slightly obtuse angle, near which stands one or two strong spines; the palm is also armed with three or four short spinules. The finger is rather longer than the palm, but slightly curved, increasing in diameter near the centre, where it gradually tapers to a point, and is furnished with three small stiff spinules, which must add considerably to the prehensile capability of the organ. The second pair of legs are also very long, slender, and membranaceous; the third joint is as long as the fourth; the wrist is half as long again as the hand, and furnished upon the under-side, which is not at all prominent, with a delicate fur of hair nearly throughout its entire length; the hand is long, pear-shaped, the broadest axis being about one-third of its length from the apex; the inferior angle being produced; the finger, which is very minute, articulates posteriorly to the inferior angle, and therefore the hand approaches somewhat to the form of a double-fingered claw; the distal extremity of the hand is covered with a fur of fine hairs. The walking-legs are subequally long and slender, the three posterior having the second joint developed to a broad scale, the two last being produced a little downwards; except the

third, all the joints are long. The wrists and the feet are subequal. The feet are furnished, upon the flexible side, with a few fine hairs, and a stout, sharp, short spine, curved reversely to the finger, which is long, slender, and appears capable of impinging against the front of the foot. The caudal appendages are subequal, the penultimate being slightly the shortest, and the branches of the last are unequal. The middle tail-piece is longer than the peduncle of the last pair of caudal appendages.

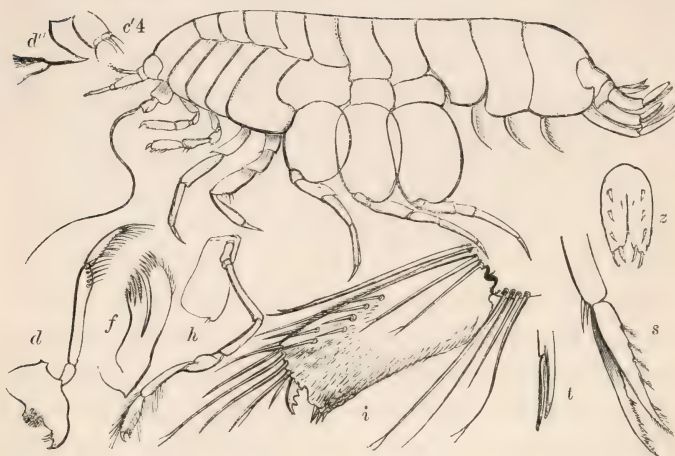
This species was sent to us by our valued correspondent, Mr. Barlee, who dredged it on the Haaf Fishing-ground, about thirty miles off the Shetland Islands, where it has also been taken by the Rev. A. M. Norman and Mr. Jeffreys. Without examination it may be mistaken for *Lysianassa marina*, (from which it chiefly differs in the generic distinction,) as well as for *Anonyx lagena* of Kroyer; but the peculiar form of the eye in the latter, which is tolerably large, and formed like an inverted comma, will offer a ready means of distinction, besides other, perhaps more important but less striking characters. From *A. ampulla* it is distinguishable by the length of the inferior antennæ.

Our figure of this species is taken from a female specimen.



AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



ANONYX AMPULLA.

Specific description. Inferior antennæ very slender, and more than half the length of the animal.

Length, $\frac{1\frac{3}{10}}$ inch.

Anonyx ampulla. KROYER, Voy. Scand. pl. xiii. fig. 2. SPENCE BATE, Ann. Nat. Hist. ser. 2, xix. p. 139 (Feb. 1857.) Cat. Amph. Brit. Mus. p. 79, pl. xiii. fig. 5. WHITE, Pop. Hist. Brit. Crust. p. 170.

THE eyes in the only specimens of this species which we have seen are obliterated in consequence of being dried. The superior antennæ are also damaged, so that the exact length cannot be stated; but the peduncle is very short, being scarcely half the length of the head; the first joint is scarcely longer than broad, the second is shorter, and the third almost lost to view; the first articulus of the flagellum is quite as long as the peduncle, the remainder are short; we have not, however, been able to determine their number, but in Kroyer's figure the flagellum is represented nearly as long as the

animal; the secondary appendage is about the length of the first articulus of the flagellum, and consists of one long and two very minute articuli. The inferior antennæ are very slender and delicate; they are more than half the length of the animal, and generally lie concealed beneath the body; the peduncle reaches rather further than the peduncle of the superior, only two of the joints are visible beyond the margin of the head, of which the penultimate joint is very broad, and continues so to its extremity, whereas the ultimate is considerably narrower, but still very much broader than the articuli of the flagellum; the first articulus of the flagellum is longer than either of the others, but very small in diameter, while all the others are still more so—a circumstance that renders the entire flagellum exceedingly fine. The epistoma is produced to a sharp spear-like point, directed straight forward. The mandibles have the second joint of their appendage much longer than the terminal. The coxæ belonging to the first and second pairs of legs have the inferior margin smooth, except towards the posterior angle, which is elevated to a small tooth, immediately before which is a depression, from the bottom of which springs a short stiff solitary spinule. The first pair of legs have the hands long and narrow, the upper and lower margins being parallel; the palm is slightly oblique and straight, but obsoletely crenulated, and defined by an obtuse angle, a little anterior to which stands a short stout spine, which is opposed to the tip of the closed finger; the finger is as long as the palm, and slightly curved. The second pair of legs are very long and slender; the third joint is longer than the fourth,—it is the great length of this joint that gives the peculiarly slender and feeble appearance to this leg throughout the genus; the wrist is rather longer than the hand, and has the inferior margin

and distal extremity furnished with hairs—those upon the latter position are very long, and split at the extremity into two branches; the hand is long and narrow, having the margins parallel and the apex truncate; the anterior half is furred with short hairs, a few long and large ones are also attached to the upper margin and apex; the finger is attached near the centre, so that the palm consists of but half the apical margin; its outline is waved, and the short finger is tuberculated upon the inner margin. The first two pairs of walking legs are uniform and tolerably robust; the last three are equally so, but they have the second joint developed into an oval scale, which extends downwards as far as the extremity of the joint next succeeding. The caudal appendages have their branches subequal, the penultimate pair are shorter than the preceding or ultimate. The terminal branches are furnished with short spines upon the upper and inner margins, those of the penultimate have the extremity of the inner branch subapically furnished with a long spine, which gives this branch the appearance of terminating in a double extremity. The central tail-piece is divided to about two-thirds of its length; the outer and upper margin of each division is supplied with three equidistant spinules, two or three more of which cover the apex of each half. These spinules or small hairs are subapically furnished with a branch still more minute.

- We have received specimens of this species from the Moray Frith, collected by the Rev. Mr. Gordon, of Elgin, and Mr. Edward, of Banff. From them our figure and description are taken. On a comparison with the figure given by Kroyer, our specimens appear to be comparatively longer, but in all other respects their identity appears to be complete.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.

b. Second pair of gnathopoda robust and more or less cheliform, first pair feeble.

Genus—CALLISOMA, COSTA.

- Callisoma.* COSTA, Cat. dei Crost. del Regno di Napoli, 1840. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 84.
Scopelocheirus. SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58. Synop. &c. Ann. Nat. Hist. xix. 138, 1857. WHITE, Hist. Brit. Crust. p. 168.

Generic character. Resembles *Anonyx* and *Lysianassa*, except that the first pair of gnathopoda are slender, and have the dactylos not unguiculate. Second pair robust, chelate. Posterior pair of caudal appendages unibranchied. Telson bifid.

THE superior antennæ are short and thick at the base. The inferior antennæ much more slender. The coxæ of four anterior pairs of appendages are as deep as the segments of the body to which they are respectively attached. The fourth segment has the posterior margin deeply excavated, to receive the anterior lobe of the fifth. The first pair of arms are long and slender, and have the finger terminating in a brush of hair. The second pair of arms are more robust than the first, and terminate in a very perfectly-formed didactyle claw. The walking legs correspond with those of the other genera in this subfamily; but the caudal appendages differ in having the posterior pair unibranchied, and the terminal plate is bifid.

AMPHIPODA.
NATATORIA.

LYSIANASSIDES.



CALLISOMA CRENATA.

Specific character. Inferior antennæ one-third the length of the animal. First pair of gnathopoda having the dactylos developed into a thick brush of short hair. Fourth segment of the pleon having on the dorsal surface a deep notch.

Length, $\frac{5}{23}$ inch.

Callisoma crenata.

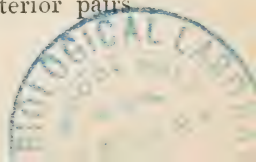
SPENCE BATE, Cat. Amph. Brit. Mus. p. 85, pl. xiv. fig. 5.

Scopelocheirus crenatus.

SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58.
Synop. &c., Ann. Nat. Hist. xix. 138 (1857).
WHITE, Hist. Brit. Crust. p. 167.

THIS species is very round and smooth, and rolls itself up almost into a ball. The head is small, and anteriorly produced into a minute flat rostrum, which is merely a projecting portion of the skin, extending horizontally with the top of the head. The antero-inferior angle projects as far forwards as the extremity of the rostrum. The eyes are small and reniform, showing black spots on a

white ground. The superior antennæ are very stout at the base; the first joint of the peduncle is nearly as long as the head, and almost as thick as long; the second joint is very short, and a little narrower than the first; the third is very short, and almost covered by the preceding; the flagellum has the first articulus very long, and broader at the base than at the distal extremity, the remaining articuli (six or seven in number) are small. The inferior antennæ are slender, and about one-third the length of the animal; the peduncle is rather longer than the peduncle of the superior; the flagellum is very slender, and lies folded beneath the body of the animal. The first pair of arms are long and slender, and have the hand long and narrow, the margins parallel, the distal extremity being anteriorly armed with several fasciculi of strongly curved hairs; the finger consists of a thick brush of short stiff hairs. The second pair are more robust than the first; the hand is ovate, with the inferior angle produced and depressed; it terminates in a small tooth; the finger is rather longer than the process of the hand, and has the inner margin waved; together they form a very perfect claw, which bears a strong resemblance to those existing in some species of Soldier Crabs (*Pagurus Dillwynii*.) The third and fourth pairs of legs are not very robust; the three last gradually increase in length. The first squamose plate of the fifth pair of legs is almost round, and corresponds anteriorly with a deep excavation in the preceding; the second squamose joint is produced posteriorly, and is broader than long; the next joint is very short; but the fourth is produced posteriorly into a small squamose plate, fringed with hairs; the wrist is short, and stouter than the hand, which is long, slender, and has the margins parallel. The two posterior pairs



are longer than the preceding, and more slender, and have the third joints and the wrists not broader than the next succeeding joints.

The segment of the body which carries the antepenultimate pair of caudal appendages is remarkable for a notch, deeply cut, near the middle, into its dorsal surface. The appendages are shorter than the penultimate; the penultimate is shorter than the ultimate; and both have their branches equal. The last pair have but one branch, which is much longer than the peduncle, and tipped with a strong single spine. The terminal plate is double, as in the genus *Gammarus*, each division being subapically tipped with a single spinule.

The colour of the animal, when taken alive, is of a tolerably bright lemon, every segment and joint being fringed with a margin of white; the whole animal is thickly covered with minute black spots. The specimens which have been sent to us, being dead, were generally fawn-coloured, tending to a bluish-grey upon the back. This constant appearance, together with the animal being less compressed than *Anonyx* and *Lysianassa*, enabled us readily to recognize any specimen.

The first species of this genus was indicated by the elder Costa in his "Catalogue of Nepalese Crustacea," published in 1840, and was subsequently described and figured in the "Fauna del Regno di Napoli, Crust.," pl. 8, fig. 4-7, by his son. The lower antennæ are not longer than the upper. A second species, *C. Hopei*, also from the Bay of Naples, was described and figured by the latter author in the "Catalogo dei Crostacei Italiani," published by the Rev. F. W. Hope, Naples, 1851; and in the "Fauna del Regno di Napoli," pl. viii. fig. 1. The lower antennæ in this species are more than half the entire length of the animal.

It is only recently that a third species has been taken, amongst some trawl-refuse brought in by the fishing-boats from near the Eddystone Lighthouse. We have also received it from the Moray Frith, where it appears to occur in considerable numbers. It has also been sent to us by Mr. Edward, from the neighbourhood of Banff; and from Macduff, where it was taken in a haddock's stomach, from thirty or forty fathoms, by Mr. Gregor. It has also been taken by the Rev. A. M. Norman and Mr. J. Gwyn Jeffreys, in forty fathoms, on the Middle Haaf Fishing Ground, in great abundance.

The vignette represents the entrance from the Moray into Cromarty Frith, and is from a sketch by the Rev. G. Gordon.



AMPHIPODA.
NATATORIA.

AMPELISCIDES.

Subfamily—AMPELISCIDES.

Ampeliscades. SPENCE BATE. Cat. Amph. Crust. Brit. Mus. p. 90.

Tetromatides. SPENCE BATE and J. O. WESTWOOD, Rep. Brit. Assoc. 1855,
p. 21.

Organs of vision differing from the normal compound eyes of the Amphipoda, and consisting only of single or detached lenses. Hands subchelate.

WHILST accepting the Genus AMPELISCA as the type, we are obliged to modify the characters of the present subfamily from those given in the "Catalogue of Amphipoda" in the British Museum, as undoubtedly the genus HAPLOOPS of Liljeborg, with which we have only recently become acquainted, must be comprehended in it. The last-named genus, of which Professor Liljeborg has taken two species upon the coast of Norway, and which we may anticipate finding upon the northern shores of Britain, differs from AMPELISCA in the absence of the prolonged head, and in only having two instead of four simple eyes.

We would here express our obligations to Professor Liljeborg, for his courtesy in sending us a drawing of *Haploops tubicola*.

AMPHIPODA.
NATATORIA.

AMPELISCIDES.

Genus—AMPELISCA. KROYER.

- Ampelisca.* KROYER, Nat. Tidskr. 1 ser. iv. p. 154, 1842. SPENCE BATE, Ann. Nat. Hist. ser. 2, vol. xx. p. 255. Cat. Amph. Brit. Mus. p. 90. LILJEBORG, Ofvers. af Kongl. Vetensk. Akad. 1851, p. 22; 1855, p. 137.
- Araneops.* COSTA, Rend. del Accad. del Sc. di Nap. 1853, p. 169.
- Pseudophthalmus.* STIMPSON, Marine Invert. Grand Manan. Proc. Nat. H. Soc. Boston.
- Tetromatus.* SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58. Ann. Nat. Hist. ser. 2, xix. p. 139. WHITE, Hist. Brit. Crust. p. 171.

Generic characters. Cephalon produced, and tapering anteriorly. Eyes four, simple, two situated on each side, near the extremity of the cephalon. Superior antennæ at the extremity of the cephalon, without secondary appendage. Inferior antennæ placed very far posteriorly to the superior. Mandibles having an appendage. Gnathopoda imperfectly subchelate. Posterior pair of pleopoda biramous. Telson squamiform, cleft.

THE animals of this very curious genus have the body long, smooth, and more compressed anteriorly than posteriorly, so much so that the anterior portion of the dorsal surface presents a wedge-shaped appearance, but scarcely carinated. The head gradually tapers in front to an obtuse point, at the extremity of which the superior antennæ are situated. The eyes are placed near the extremity of the head, and consist of two small simple organs upon each side, four in all, whence the generic name "*Tetromatus*," we had proposed, at the suggestion of our excellent friend, Mr. Adam White. The superior antennæ are without a secondary append-

age. The inferior antennæ are situated very far posteriorly to the superior. The mandibles possess a three-jointed appendage. The arms are slender, feeble, and imperfectly subchelate. The third and fourth pairs of legs are uniform, and have the fourth joints long and broad, the wrists short, and the fingers very long and styliform. The fifth and sixth are also uniform; they have the fingers short, and directed posteriorly. The seventh differ from the others, and have the foot broad and the finger straight. The posterior pair of caudal appendages are subfoliaceous; the branches are subequal. The caudal plate is squamiform, and cleft down the centre.

The following vignette, for which we are indebted to our friend Dr. Scott, of Selby, Shetland, is a view of the Doreholms, Shetland, as seen by the *Aurora Borealis*.



AMPHIPODA.
NATATORIA.

AMPELISCIDES.



AMPELISCA GAIMARDII.

Specific character. Posterior margin of the third segment of the pleon plain. Superior antennæ one-third the length of the animal. Inferior antennæ very slender, two-thirds the length of the animal.

Length, $\frac{3}{4}$ inch.

Ampelisca Gaimardii. KROYER, Voyage en Scand. Crust. pl. xxiii. fig. 1.

SPENCE BATE, Cat. Amph. Brit. Mus. p. 91, pl. xv. fig. 1.

Araneops diadema. A. COSTA, Rend. del Accad. Sc. di Nap. 1853, p. 171, Tav. i. fig. 1.

Tetromatus typicus. SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58. Synop. Ann. Nat. Hist. ser. 2, xix. p. 139. WHITE, Hist. Brit. Crust. p. 171, pl. x. fig. 4.

THE anterior half of the animal is much more compressed than the posterior, and narrowed to an angle upon the dorsal surface, the angle increasing anteriorly to the extremity of the head. The eyes consist of simple

lenses, four in number, two upon each side of the head, fixed in the integument itself. Behind these fixed eyes is a mass of dark-red pigment: close observation, with a microscope, exhibits this as connected with the organs of sight, threads of white pigment ramifying over the red mass, and appearing to consist of two sets, one belonging to each organ, although only partially connected; sufficiently so, however, to show that the two lenses belong to one and the same organ of vision.

The number of lenses belonging to the eye of an Amphipod increases with the growth of the animal; to such an extent is this the case, that whereas in the larva of a *Gammarus*, we have counted but eight, we find that in the adult there are no less than forty in each eye. We therefore consider that, in this genus, an arrest has taken place at an early stage, and limited the number of lenses to two, and thus produced an apparently imperfect organ of vision.

The superior antennæ are longer than the peduncle of the inferior, and are about one-third the length of the animal; the first joint of the peduncle is short and stout, and carries several fasciculi of hairs upon the inferior margin; the second is twice as long, and not so broad, and furnished upon the inferior margin with many fasciculi of hairs; the third joint is very short, and increases in diameter towards the distal extremity; the flagellum is about twice the length of the peduncle; the first articulus is as broad at the base as the last joint of the peduncle, and nearly as long; it gradually tapers to the distal extremity, the under margin is thickly crowded with auditory cilia of peculiar form; these are long and slender, the basal half broader than the distal, and the extremity furnished with a minute denticle; the rest of the articuli are small and slender, each carrying, above

and below, two or three very minute hairs; the second articulus likewise carries a single auditory cilium. The inferior antennæ are as long again as the superior, and reach to about two-thirds of the length of the animal. The third and fourth joints of the peduncle are furnished on the upper margin with fasciculi of hairs, the former through the entire length, the latter for a portion only; the last joint of the peduncle is longer and more slender than the preceding one: the flagellum, of which the first articulus is longer than either of the others, is very long and very slender, and is furnished with a few very minute cilia. The mandibles have the incisive margin armed with four or five strong teeth; within is a second plate, articulated with the mandible, and equally strongly armed; deeper within exists a broad strongly toothed molar process, between which and the moveable plate already referred to stands a row of stiff forked spines, each of which is denticulated along the margins throughout its length: the appendage of the mandibles has the first joint very short, not being longer than broad; the second is very broad, and forms a long ellipse, having the upper margin furnished with four fasciculi of hairs; the third joint is scarcely as long as the second, very much more slender, slightly curved, and of equal breadth throughout; the underside is furnished with a few hairs, commencing near the middle, and increasing in length towards the apex. The foot-jaws have the finger long and slender; the sixth joint, or hand, is short; the wrist is longer than the hand and finger together, but the joint anterior to the wrist is very short, and carries a large squamiform plate, arcuate upon the outer, and straight upon the inner side, armed with six slightly-curved simple teeth, the most anterior

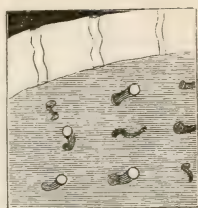
of which is fixed below the apex of the plate; the third joint is likewise formed into a squamiform plate, much smaller and more rounded than the preceding, and furnished at the apex with a few plumose hairs. The arms are long and slender, and differ but little from each other. They are very imperfectly subchelate. The first pair are rather the more robust of the two; the hand is much shorter, and has the inferior margin more convex; the palm is very oblique, and not defined; throughout the whole of the inferior margin, including the palm, the joint is furnished with fasciculi, or rather, short rows of hairs, most of which are short and simple; but there exists one or two in each fasciculus much longer than the rest, straight and plumose: the wrist is longer than the palm, and has the inferior margin furnished with several short transverse rows of simple hairs: the finger is half the length of the hand, and is tipped with an unguis or nail, and armed upon the inner side with three or four strong spines, furnished with a serrated or spinous edge. The second pair of arms are rather longer than the first: the wrist is furnished with long plumose hairs, planted in short transverse rows, laterally to the inferior margin; the hand is long, and of nearly equal breadth throughout, without any distinguishable palm, the inferior margin is furnished with several short transverse rows of simple and plumose hairs; the finger is but one-fourth the length of the hand,—it is unguiculate, and has the inner margin armed with five or six small spines. The third and fourth pairs of legs resemble each other, and differ in form from those of other Amphipoda, the fourth joint being long and broad, making a long ellipse, convex upon the outer, and flat upon the inner surface, and

having the posterior margin fringed with long plumose hairs; the wrist is short, scarcely longer than broad, and having the posterior margin fringed with long plumose hairs; the foot is three times as long as the wrist,—it has the margins almost parallel, tapering towards the distal extremity; the outer margin, towards the distal extremity, has long plumose and a few short simple hairs; the inner has, at the same extremity, four or five short stout spines: the finger is longer than the hand, very slender, and almost straight; it is capable of impinging laterally against the inner margin of the hand, the apex reaching beyond the wrist. The fifth pair of legs have the second joint dilated, oval, being enlarged as much anteriorly as posteriorly; the fourth and fifth joints are subequal in length and size; the latter terminates abruptly, and has the extremity furnished with five or six short blunt spinules, subapically tipped with a single cilium, and a few long hairs, which have their margins, for nearly the distal half, serrated deeply; the foot is much narrower than the wrist, but is quite as long,—it has the margins almost parallel, the extremities being a little narrower than the diameter of the middle of the joint; the anterior margin is furnished with a row of equidistant, short, obtuse-pointed spines, subapically tipped with a single cilium; towards the extremity of the foot the spines gradually increase in length and in sharpness, until on the apex they pass into the character of hairs; the posterior margin has the distal half minutely crenulate, and armed with three spines, which gradually increase in length and strength the nearer they approach the finger, in the last of which the subapical cilium has increased in strength until it has become as important as the primary division; the finger



articulates towards the posterior margin of the foot, and is directed backwards, contrary to the usual plan in the Amphipoda; it is short, strong, and sharp, and furnished on the outer surface with a few minute hairs. The sixth pair of legs resemble the preceding, except that the second joint is larger. The seventh pair differ from all the preceding: the second joint is very long; the plate is long-ovate, broader below than above, and postero-inferiorly produced to the extremity of the next succeeding joint; the foot is long-ovate, and furnished at the distal extremity with a few hairs and spines; the finger is broad, flat, straight, and lanceolate: near the posterior margin is a longitudinal row of circular spots. The caudal appendages are unequal in length; the antepenultimate have the branches longer than the peduncle; the lower branch is simply styliform, the upper is slightly longer, of the same form, but having the upper margin fringed with a row of equidistant spines. The penultimate pair have the peduncle with the upper margin spinous; the branches are subfoliaceous, and curved so as to fit one against the other, and both have their margins thickly fringed with equidistant sharp spines. The ultimate pair are likewise subfoliaceous: the lower branch has the lower margin fringed with spines, and the distal extremity of the upper is furnished with simple hairs; the upper branch is broader than the lower, and has the under surface hollowed, to admit of the under branch being closely pressed against it; it has only the distal inferior margin furnished with hairs. The middle tail-piece is longer than the peduncle of the last pair of caudal appendages, narrow, and divided to nearly two-thirds of its length, and the lateral margins are bent to an angle.

The skin, as examined beneath the microscope, is very transparent; it is free from any trace of its cell-origin; it is moreover perforated by pores of different sizes, which appear to pass in a waving line directly through the tissue.



The colour of the animal is hyaline white, having a blush of rose-colour on many parts of the body, particularly the extremities, and the posterior segments of the body; the extremities of some of the joints of the peduncles of both pairs of antennæ are distinguishable by a distinct spot of red. We have kept several of this species in tanks, but they seldom live long, and immediately that they are placed in the vessel, dart to the bottom and hide themselves from view, (a peculiarity probably dependent on the structure of the eyes,) so that we have not been enabled to obtain any knowledge of their peculiar habits.

The species was first named by Kroyer from an Arctic specimen; but it is very common all round our coast, in some few fathoms of water, and, we believe, generally in muddy ground. Its long proboscidiiform head appears to be peculiarly adapted for burrowing beneath the softer bottoms of the sea, and the character of its eyes also indicates a habitat where organs of vision are but little required. The mandibles, with their tearing processes, (unlike the smooth incisive margins in *Lysianassa*,) suggest a carnivorous rather than a vegetable-feeding habit, decaying animal matter and small creatures found in the mud being probably its food.

We have received specimens from the Rev. Geo. Gordon, taken in the Moray Frith; off the Island of Skye, dredged by Mr. Barlee; Rishbank, Dublin Bay, from

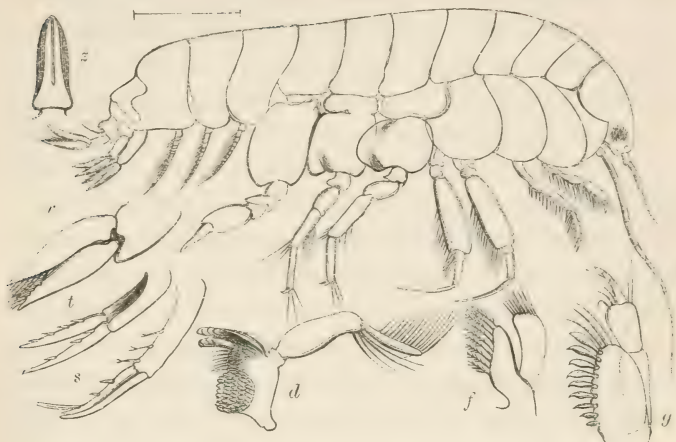
Professor Kinahan; off Fowey, taken by Mr. Wells, of the Admiralty Survey; and in Plymouth Sound it has been dredged by Mr. T. P. Smyth, and ourselves. Costa procured his specimen, which, as far as his imperfect description will enable us to judge, we consider to belong to this same species, upon the coast of Naples. It has also been dredged from twenty fathoms deep, at the entrance of Belfast Bay, by Messrs. Hyndman and E. Goodsir, at the beginning of the month of October. These last are in the Collection of the Belfast Museum. Recently it has been taken in the Shetlands by the Rev. A. M. Norman and Mr. J. G. Jeffreys in Outer Skerries Harbour, in from one to two fathoms; near Whalsey Lighthouse, in forty fathoms; and sixty miles east of Shetlands, in from seventy to ninety fathoms of water.

The accompanying vignette of Inch Abbey, co. Down, was kindly sketched for us by Mrs. Campbell.



AMPHIPODA.
NATATORIA.

AMPELISCIDES.



AMPELISCA BELLIANA.

Specific character. Third segment of the pleon having the posterior margin deeply bisinuated on each side. Superior antennæ shorter than the peduncle of the inferior.

Length rather more than $\frac{1}{2}$ inch.

Tetromatus Bellianus. SPENCE BATE, Brit. Assoc. Rep. 1855, p. 53. Ann. Nat. Hist. xix. 139. Cat. Amph. Brit. Mus. p. 93, pl. xv. fig. 3. WHITE, Hist. Brit. Crust. p. 171.

THIS animal, in its general appearance, resembles *A. Gaimardii*, but may be distinguished from it by the contour of the posterior margin of the tenth segment after the head; on each side it is waved, having a deep indentation near the upper part, a prominent lobe about the middle, a second indentation below the lobe, beneath which the inferior margin is produced to a sharp slightly upturned process, or tooth.

The superior antennæ are not longer than the head. The first joint of the peduncle is very short, scarcely longer than broad; the second joint is about twice the

length of the first, and more slender; the third is very short; the flagellum is scarcely as long as the peduncle. The inferior antennæ are about one-third the length of the animal; the peduncle is longer than the superior antennæ, of which the penultimate joint is twice the length of the ultimate; the flagellum is scarcely as long as the peduncle. The mandibles have no appreciable distinction from those of *A. Gaimardii*. The foot-jaws have the antepenultimate joint reaching scarcely to the extremity of the squamose process of the preceding joint; the penultimate joint is nearly as long as the one before it, and itself is longer than the finger, which terminates in a sharp nail; the spines upon the squamose plate differ from those in *A. Gaimardii* in form as well as in length; they are eight in number, and rapidly increase in size from the base to the top of the plate; their form is that of a lancet-blade, slightly hooked at the point, and narrowed at the base; the apex of the plate is crowned with three hairs, or long spines. The arms and two following pairs of legs resemble those of *A. Gaimardii*, as well as the fifth pair of legs, except that the second joint is quite as broad as long. The sixth pair have the second joint quadrate, with the postero-inferior margin slightly produced downwards. The second joint of the last pair is not so much postero-inferiorly produced as in *A. Gaimardii*, and the penultimate joint is broader. The caudal appendages scarcely differ from those of the other species, except that the branches are not proportionally so long, and their margins are less numerously and regularly fringed with spines. The terminal scale is long, narrow, and split from the apex nearly to the base, and the lateral margins are bent to an angle.

The colour scarcely differs from that of *A. Gaimardii*,

but we have taken one or two specimens with some beautiful stellate crimson spots, as well as several black ones near the organs of vision.

We first procured this species from our valued correspondent, the Rev. Geo. Gordon ; since which we have received it from Mr. Edward, both having taken it in the Moray Frith. It has also been dredged by us in Plymouth Sound ; and in the British Museum are specimens which Mr. Barret has taken in the North Atlantic.

This species is much more rare than *A. Gaimardii*, and apparently less extended in its geographical range. Professor Liljeborg has taken, at Kullaberg, on the coast of Norway, a species, *A. macrocephala*, which, from his description, bears so close resemblance to the present, that we should have regarded them as identical, but that he says the fourth segment of the pleon is carinated, and the sixth is posteriorly obtusely bidentate. Mr. Stimpson has also recorded a species, *A. ingens*, taken at Grand Manan, on the coast of America, which somewhat resembles *A. Belliana*, but differs in having the margin of the sinuated segment less deeply waved, the greater length of the superior antennæ, the more perfectly developed form of the first pair of hands, and lastly, in that truly American feature, its large size—being three times as large as the European form. M. Holboll has also found this last species in forty fathoms of water, on the coast of Greenland.

The species is inscribed with the name of Professor Bell, F.R.S., &c., whose work on the “British Stalk-Eyed Crustacea” has greatly tended to the study of this branch of Natural History, and to whom we are bound to offer our warmest thanks for the assistance he has afforded us, with his wonted urbanity, in the preparation of this work.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Subfamily—PHOXIDES.

Pontoporeides. DANA, Un. St. Explor. Exped. p. 912. SPENCE BATE and WESTWOOD, Rep. Brit. Assoc. 1855, p. 21.

Phoxides. SPENCE BATE, Ann. Nat. Hist. 1857, vol. xx. p. 525. Cat. Amph. Brit. Mus. p. 97.

Cephalon produced in advance, more like a hood than a rostrum. Inferior antennæ situated considerably posterior to the superior.

THIS subfamily offers several aberrant characteristics. The head is generally produced far in advance of the antennæ, looking like a hood hanging over the basal portions. The eyes in the most typical genera are almost rudimentary, and exist in the form of an orbicular mass of pigment, deeply seated in the head, without any lenses observable on the surface. The antennæ are situated nearly in the same plane, the one behind the other.

The peculiar form of the head, together with the imperfect character of the eyes, induce us to believe that these animals dwell where vision is not essential, some burrowing in sandy or muddy bottoms, while others exhibit features of a parasitic character.*

The genus *Pontoporeia* being closely allied to *Anonyx* in the preceding sub-family, we have been compelled to reject Dana's sub-family name, and have employed in its stead a name derived from one of the most typical of its genera.

* The recent observations of Mr. Spence Bate on the development of some species of *Hyperina* induce us to believe that there is a nearer connection between this sub-family and the latter than has hitherto been assigned to them.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—PHOXUS. KROYER.

Phoxus. KROYER, Tidsk. vol. iv. p. 150.

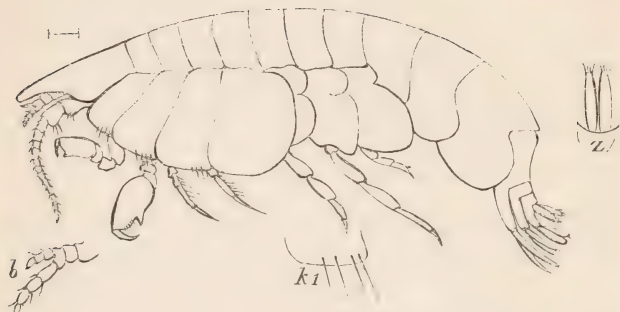
Generic character. Cephalon considerably produced anteriorly to a point, not much depressed. Superior antennæ having a secondary appendage. Maxillipedes subpediform. Gnathopoda subchelate. Posterior pair of pereiopoda shorter than the others. Telson double.

THIS genus may be taken as the type of the subfamily. It has the head considerably advanced in front, and produced into a blunt point, but which is not much depressed. We have not observed the eyes, but Stimpson speaks of them as being two in number, but they are very imperfect, and generally white, and disappear soon after death. The superior antennæ carry a secondary appendage, which is generally very long. The mandibles are furnished with an appendage. The foot-jaws have the squamiform plates but little developed; thus bearing a considerable resemblance to the ordinary walking legs. The hands are subchelate, and nearly of the same size. The last pair of walking feet are very short, being considerably shorter than any of the others. The last pair of caudal appendages are biramous, and the terminal plate is double.



AMPHIPODA.
NATATORIA.

PHOXIDES.



PHOXUS SIMPLEX.

Specific character. Superior antennæ scarcely reaching beyond the extremity of the cephalon. Inferior antennæ nearly three times as long as the superior. Three anterior coxæ having four simple hairs near the hinder angle of the inferior margin.

Length, $\frac{3}{35}$ inch.

Phoxus simplex. SPENCE BATE, Ann. Nat. Hist. 2 ser. 1857, vol. xx. p. 525. Cat. Amph. Brit. Mus. p. 97, pl. xvi. fig. 1.

Phoxus Kroyeri. SPENCE BATE, Synopsis, &c. Ann. Nat. Hist. Feb. 1857, 2 Ser. xix. p. 152. Brit. Assoc. Rep. 1855, p. 58 (not of Stimpson in Proc. N. Hist. Soc. Boston). WHITE, Hist. Brit. Crust. p. 173.

THIS species has the dorsal surface of the head considerably produced, and gradually narrowed, without being curved downwards, and with the apex obtusely rounded. The eyes have not been observed, owing probably to the circumstance of the animal not having been examined until some time after death, whence we are led to suppose that they are imperfect in their structure. The superior antennæ are very short, scarcely reaching beyond the extremity of the overhanging head; the

peduncle is very short; and the flagellum is scarcely longer; the secondary appendage consists of but three articuli, and is nearly as important as the primary, which is formed of but four. The inferior antennæ are about as long again as the head, and three times as long as the superior; the peduncle does not reach as far as the apex of the projecting head; and the flagellum, which consists of about ten or twelve articuli, has each articulus almost as broad as long. The coxæ of the arms and first two pairs of walking legs are very large, broad, and much deeper than the respective segments of the body; the three anterior are furnished, towards the posterior portion of the inferior margin, with four simple hairs, which number appears to us to be persistent, as five are to *P. Holbolli*, and a greater number to *P. plumosus*; the arms are subequal, the first pair being rather the smaller; the wrist is short, and the hand twice as long as broad; the inferior margin runs parallel with the superior, but is not quite so long; the palm is slightly oblique, and defined by a small tooth at the inferior angle; the finger is of the same length as the palm. The second pair of arms vary but little in form from the preceding; the hand is a little larger, it is rather broader towards the base, both margins are convex, the inferior is about one-third shorter than the superior; the palm is much more oblique than that of the first pair, it is also slightly convex, and defined by a larger tooth at the inferior angles: the finger is slightly curved, and is about the length of the palm. The walking legs are rather slender. The first two pairs have the fingers rather long and straight. The fourth pair of these legs are longer than the third, but the fifth are much shorter than either, and apparently useless; the squamiform thigh is larger than that of the preceding legs, and

broadest below; the rest of the leg is only equal in length to that of the thigh. The antepenultimate pair of caudal appendages have the plates as long as the peduncle, those on the two posterior pairs are shorter, and the middle piece consists of two narrow, unarmed plates, with a few fine spines at the extremity.

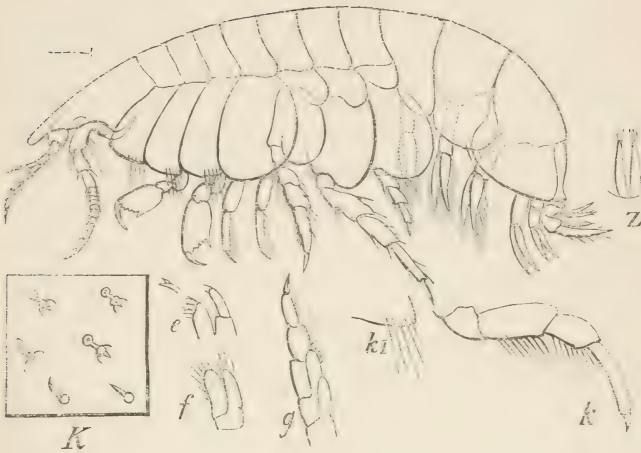
The only place from which this species has been received is that of Plymouth Sound, where it was taken by us with the dredge.

The vignette is by Mitchell, and represents the Mew Stone, Plymouth Sound.



AMPHIPODA.
NATATORIA.

PHOXIDES.



PHOXUS HOLBOLLI.

Specific character. Superior antennæ having the peduncle reaching as far as the extremity of the cephalon; flagellum as long as the peduncle; secondary appendage half as long as the primary. Inferior antennæ scarcely longer than the superior. Gnathopoda subequal; propoda quadrate; palm but slightly oblique; three anterior coxæ having each five simple hairs upon the inferior margin, towards the hind-angle.

Length $\frac{1}{4}$ inch.

Phoxus Holbolli. KROYER, Tidsk. vol. iv. p. 150. SPENCE BATE, Synop. &c. Ann. Nat. Hist. Feb. 1857, p. 58. Cat. Amph. Brit. Mus. p. 98, pl. xvi. fig. 2. WHITE, Hist. Brit. Crust. p. 173.

THE general appearance of the animal much resembles that of *P. simplex*, but the antennæ are longer, the superior pair are nearly as long as the head, and extend considerably beyond the extremity of the cephalon; the peduncle reaches quite to the anterior margin of the projecting hood; the first joint of the peduncle is tolerably long, but almost hid beneath the walls of the head; the

second and third joints are small; the flagellum consists of seven articuli, and is rather longer than the peduncle. The secondary appendage is about half the length of the primary. The inferior antennæ are slightly longer than the superior; the peduncle extends beyond the peduncle of the superior; the flagellum has the first four or five articuli very short, the remainder irregularly increasing in length. The foot-jaws nearly resemble true legs, and terminate in a short sharp-pointed finger, retaining the characteristic of their true nature only in two small scale-like processes, springing from the second and third joints,—the joints are all of the same length. The large squamose coxæ of the four anterior pairs of legs are deeper than their respective segments, the three anterior having the posterior half of the inferior margin furnished with five hairs, the hindmost of which is short. The coxæ of the three posterior pairs of legs are much shorter than those of the preceding pairs. The first two pairs of legs are subequal, tolerably strong, each having a hand of nearly similar form; that of the first pair is almost quadrate, the margins nearly parallel, the palm is somewhat oblique, slightly convex, and slightly serrated, defined by a short sharp tooth. Those of the second pair are rather longer, and have the palm defined by a longer and sharper denticle; the fingers are sharp and slightly curved. The next two pairs of legs are slender; the fifth pair are tolerably robust, but not very long, having the second joint considerably dilated posteriorly; the sixth pair are longer than the fifth, very similar in form. The seventh also resemble them, but are very much shorter, the third and following joints being scarcely as long as the largely-dilated second joint; all the legs after the first two have the finger very short. The three pairs of natatory appendages are not very long, and are pro-

tected by the deep lateral walls of the segments to which they are attached. The caudal appendages terminate subequally, the posterior pair being a little the longest; the two preceding have the styliform rami equal in length, and free from hairs; the last pair have the peduncle short, and the rami unequal, the outer branch being one-third longer than the inner. The middle tail-piece is double, each division being long and tapering, and the apex tipped with a few small hairs.

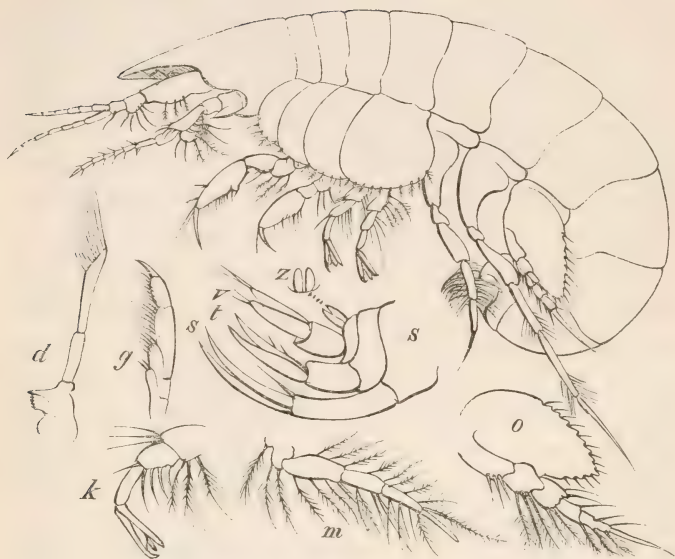
The animal, as far as we have been able to judge from recently-dead specimens, is transparent and colourless; nor have we been able to detect any eye. The surface of the skin is sparsely covered with small hairs, some of which are simple, while others have a club-shaped apex. Judging only from Kroyer's description, we have but little doubt that this species is identical with that which he named after M. Holboll.

We first found it as British by dredging it in Plymouth Sound; it has since been sent to us from Banff by that indefatigable lover of nature, Mr. Edward.



AMPHIPODA.
NATATORIA.

PHOXIDES.



PHOXUS PLUMOSUS.

Specific character. Superior antennæ longer than the cephalon. Inferior antennæ scarcely as long as the superior. Gnathopoda having the propodus long-ovate; palm very oblique. Hairs on the margin of the coxæ, as well as on the legs, plumose.

Length, $\frac{4}{30}$ inch.

Phoxus plumosus. KROYER, Tidskr. vol. iv. p. 150. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xx. p. 525, Feb. 1857. Cat. Amph. Brit. Mus. p. 99, pl. xvi. fig. 3. WHITE, Hist. Brit. Crust. p. 173.

Phoxus fusiformis. STIMPSON, Mar. Invert. Grand Manan, p. 57.

THIS animal in its general aspect much resembles the other species of this genus, but the projecting surface of the head is less acute. We have not been able to make out the eyes; but Mr. Stimpson says, that in the American specimen (which we consider, from his description, to be synonymous with the British) they are white. The

superior antennæ have the peduncle reaching as far as the extremity of the head; the first joint is very long, and reaches nearly to the anterior margin of the head,—it is furnished upon the inferior margin with three short plumose hairs; the second joint is very short, being but little longer than broad, inferiorly slightly dilated, and armed with five simple hairs; the third joint is shorter than the second, and more slender; the flagellum is slender, and as long as the peduncle, consisting of seven or eight articuli, of which the first is as long as three others; the secondary appendage is slender, and nearly as long as the primary, and consists of six articuli. The inferior antennæ are rather shorter than the superior; the peduncle reaches as far as the extremity of the first joint of the peduncle of the superior; the penultimate joint is the longest, and is inferiorly dilated into a squamiform process, with a convex margin, and fringed with several plumose hairs, as is also the antero-superior margin; the last joint is short and slender; the flagellum is more slender still,—it is shorter than the peduncle, and consists of seven or eight articuli, of which the first is as long as the two succeeding. The mandibles are short, (having the incisive margin armed with denticles,) and furnished with a long two-jointed appendage; the distal joint being longer than the basal, terminating obliquely and carrying a row of closely-set hairs, which increase in length towards the extremity. The foot-jaw bears a considerable resemblance to an ordinary leg, but is distinguishable by a small squamiform process, developed both from the third and fourth joints, which are subequally short; the fifth is long, and fringed upon the inner margin with hairs; the sixth joint is scarcely half as long as the fifth, fringed like the preceding, the fringe

short, sharp, and slightly curved. The four anterior coxæ are large, quite as deep as the segments of the body to which they are attached respectively, and each has the inferior margin fringed with a row of equidistant, solitary, short, plumose spines. The first pair of legs are slender, tolerably long, having the metacarpus and wrist fringed upon the inferior side with a few plumose cilia; hand long, narrow, tapering; palm two-thirds the length of the hand, exceedingly oblique, defined by a small obtuse denticle, and fringed with a row of equidistant fine cilia: finger long and slender, as long as the palm, and nearly straight. The second pair of legs resemble the first, but are scarcely as large, and the palm is slightly waved, and not so distinctly defined, and the finger appears to be scarcely as long as the palm. The third and fourth pair of feet are slender, fringed with cilia, both plumose and simple, having the hand straight and unarmed; the finger as long as the hand, straight, stout, and furnished with a nail at the extremity; on the distal extremity of the hand, on each side of the finger, stands a moveable spine, as stout and long as the finger, apparently having the power of being compressed together, each fitting into a lateral groove in the finger, thus forming a feeble and insufficient nipper. The fifth pair of legs are long, slender, and plumose, the coxa is short, and the thigh tapering, with a posterior concave margin to the distal extremity; all the joints after the knee are subequal in length; the finger is quite straight. The sixth pair of legs resemble the preceding in form, but are nearly half as long again; the joints after the knee are subequally long and slightly plumose; the finger is longer than the hand, straight and styliform. The seventh pair of legs are very short, reaching only to the middle of the metacarpal joint of the sixth pair of

legs; the coxa is very short, but the thigh is largely dilated, and postero-inferiorly produced to a blunt point, reaching as far as the wrist; the inferior and posterior margins are slightly crenated, each crenulation emitting a solitary hair; all the joints, except the finger, (which is long, straight, and styliform,) are subequally short. The caudal appendages are free from hairs or spines; they terminate subequally, the antepenultimate pair being slightly the longer, and the penultimate pair the shortest. The branches are subequal, those of the last pair being rather less pointed than those of the two preceding pairs. The central piece is double, but not so long as the peduncle of the posterior pair of caudal appendages.

The colour of the animal is corneous and transparent. The structure of the tissue, under the microscope, is seen to be minutely granular.

Kroyer, in his description, says that a few spines exist upon the third and fourth joints of the peduncle of the inferior antennæ in *P. Holbolli*, but that they are absent in *P. plumosus*. In one specimen of *P. Holbolli* the hairs upon the inferior antennæ are scarcely robust enough to be called spines; whereas in *P. plumosus* there are a few plumose hairs, of which Kroyer makes no mention. In other respects the animals appear to correspond with Kroyer's description, and we do not feel justified in separating them upon such immaterial distinctions. The only difference between *P. plumosus* and Stimpson's specimen of *P. fusiformis* consists in the American specimen having what the author of its description calls "more nails on third and fourth legs." Now these so-called "nails" we take to be the long lateral spines that impinge against the sides of the fingers of the third and fourth pairs of legs.

It was first taken by Holboll on the coast of Greenland, from whence the great northern currents probably drifted it to the shores of America: for, generally speaking, the Crustacea of the eastern coast of America are very distinct from those of the western coast of Europe; and in instances where they may be found to be identical, (as we believe to be the case with this species,) they are essentially Arctic forms, which yield to the opposite shore of each continent some few wandering specimens.

We have taken it with the dredge from Plymouth Sound, from which specimen our figure was drawn and described, but the figure of the caudal appendages was drawn from another specimen. Mr. Barlee has taken it while dredging in the Shetlands, as have also very lately the Rev. A. M. Norman and Mr. J. Gwyn Jeffreys. The specimen which Stimpson describes as distinct, but which we have incorporated with this species, was taken by him with the dredge on coarse sandy bottoms, in the laminarian and coralline zone on the coast of the Isle of Grand Manan, U.S., North America.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—GRAYIA.

Grayia. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 101.


Generic character. Cephalon anteriorly produced. Eyes two. Superior antennæ without a secondary appendage. Gnathopoda subchelate. Pereiopoda subequal. Posterior pair of pleopoda biramous. Telson squamiform.

THE head is only moderately produced in front, and does not terminate in a point. The eyes are two, one on each side of the head, in the normal position of those organs. The superior antennæ are not furnished with a secondary appendage. The inferior antennæ are not so robust as the superior. The three posterior pairs of walking legs are strong and subequal in length, and terminate in sharp-pointed fingers. The last caudal appendage is double-branched, and the middle tail-piece is squamiform and apparently simple.

We consider this genus to bear a close affinity to *Odiceros* Kr., from which it is distinguished by the shortness of the last pair of the walking legs, which, in this genus, are not longer than the preceding pair.

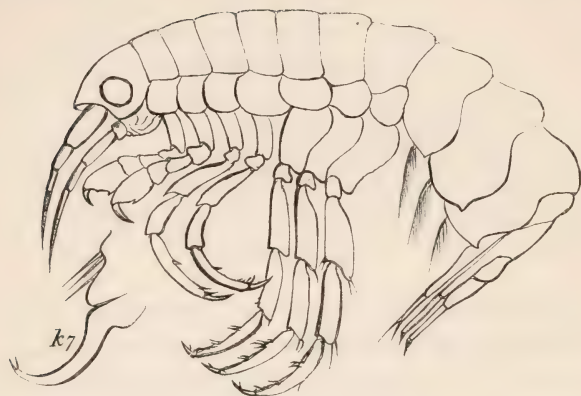
The animal possibly may be parasitic; but if it possesses similar habits to *Darwinia*, it differs generically in the size of the arms, the form and depth of the coxæ, the less dilated character of the body, and the absence of the unusual character of the third segment of the tail being considerably less deep than the second.

This genus is named in compliment to Dr. J. E. Gray, F.R.S., &c., the indefatigable keeper of the Zoological Collection of the British Museum, to whose zeal its present efficient state is mainly owing.



AMPHIPODA.
NATATORIA.

PHOXIDES.



GRAYIA IMBRICATA.

Specific character. Three anterior segments of the pleon posteriorly elevated. Eyes large.

Length, $\frac{4}{25}$ inch.

Grayia imbricata. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 101, pl. xvi, fig. 4.

THE head is anteriorly produced, and rounded in front, but not extending to a point. The three segments of the anterior part of the tail are each posteriorly raised, giving, when viewed laterally, an imbricated appearance to the dorsal margin, a circumstance that suggested the specific name of the animal. The eyes are rather large, tolerably round, and very black. The superior antennæ are not longer, but stouter, at the base of the peduncle than the inferior. The inferior are more slender and less tapering than the superior, and equal in length to the head and the first three segments of the body. The coxæ are not so deep as the body, and the four anterior are equal in size. The first two pairs of legs are subchelate; the hands are subovate, the palms

oblique, and the fingers short and curved. The walking legs are nearly all of the same length, and each terminates in an evenly-curved finger, sub-apically furnished with a single short hair. The three caudal appendages are subequal in length.

This species was first sent to us by our friend Mr. W. Webster, who dredged it in Falmouth Harbour. We have since received it through the kindness of the Rev. A. M. Norman, (who has forwarded to us his entire collection of Edriophthalmous Crustacea for examination,) having been taken by Mr. Alder off the coast of Northumberland: this northern specimen appears to possess the imbricated character, more strongly expressed than in that from Falmouth.



AMPHIPODA.

PHOXIDES.

NATATORIA.

Genus—WESTWOODILLA.

- Westwoodilla*. SPENCE BATE, Cat. Amph. Brit. Mus. p. 102.
Westwoodea (pars). SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58.
Westwoodia. Synop. Amph. Ann. Nat. Hist. 2 ser. xix. p. 139, Feb. 1857. WHITE, Hist. Brit. Crust. p. 172.

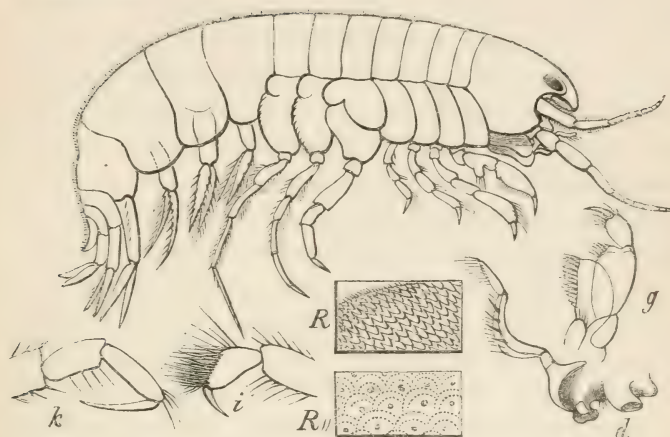
Generic character. Cephalon anteriorly produced. Eyes confluent. Superior antennæ without a secondary appendage. Mandibles appendiculated. First pair of gnathopoda subchelate. Second pair not subchelate. Posterior pair of pereopoda longest. Posterior pair of pleopoda biramous. Telson squamiform.

THE head is produced anteriorly as in *Phoxus*, but more depressed. The eyes are associated, so that they appear as a single organ, imbedded within the head. The antennæ are simple, the superior having no secondary appendage. The mandibles are furnished with an appendage. The first and second pairs of legs are subequal; the first pair are subchelate,—the second are not so, but terminate in a finger, which does not fall back against the hand. The walking feet gradually increase in length, but the last is considerably longer than the rest. The posterior pair of caudal appendages are biramous, and the terminal plate is squamous.

This genus resembles *Monoculodes* of Stimpson, but differs from it in having the hands less perfect in their prehensile character. The name *Westwoodea* proposed in the "Report on the British Edriophthalma" required to be changed, in consequence of its having been previously adopted by Dana for a genus of ENTOMOSTRACOUS Crustacea, and by Brullé for a genus of Hymenoptera.

AMPHIPODA.
NATATORIA.

PHOXIDES.



WESTWOODILLA CÆCULA.

Specific character. Antennæ subequal. A central nucleus to each cell in the microscopical structure of the skin.

Length, $\frac{4}{10}$ inch.

Westwoodilla cæcula. SPENCE BATE, Cat. Brit. Amph. Brit. Mus. p. 102.

Westwoodea cæculus. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58.

Westwoodia cæcula. SPENCE BATE, Synop. Ann. Nat. Hist. 1857, 2 ser. xix. p. 139. WHITE, Hist. Brit. Crust. p. 172.

THE animal has the head considerably produced, and anteriorly depressed, having the frontal margin rounded. The eye appears to stand upon a process of the head, between and above the superior antennæ, but not to be in connection with the projected hood-like process. It is of a dull red-purple colour, but without a clearly-defined outline, a circumstance that has led to the selection of the specific name, as it has every appearance of being an imperfect organ of vision. The antennæ are nearly of equal length; the superior are scarcely longer than the head,—they have the first two joints of the peduncle

nearly the same length, but the third is much shorter and slighter, and the flagellum is not more than twice the length of the last joint of the peduncle. The inferior antennæ are but little longer than the superior; the joints of the peduncle are more nearly equal in length, but the last is more slender than the preceding; the flagellum is but little longer than the last joint of peduncle. The mandibles appear to be very strong,—they are exceedingly hollowed; the incisive margin is smooth, and has the extremities rounded; within there is a second plate, but of much smaller dimensions; nearer the head stands a very large molar tubercle. The appendage to the mandible is three-jointed, the second, longer than either of the others, is triangular in its diameter, and strongly curved. The foot-jaws are short and strong,—the third joint is furnished with a large squamous plate, the outer margin of which is rounded, and the inner straight, fringed with spines and small hairs alternately, and increasing in length; the fifth joint is broad, longer than the fourth or sixth, which last is ovate, and supports a strong finger. The first pair of arms are subchelate,—they are not very long, and have the wrist as long as the hand; the infero-anterior angle is anteriorly produced into a rounded lobe, the inferior margin of which is fringed with a few hairs; the hand is elongate-ovate, the palm occupies nearly the whole length of the inferior margin, and is imperfectly defined by a small tooth, and fringed with a series of equidistant cilia of equal length; the finger appears to be scarcely as long as the palm,—the whole organ is but inefficient in its prehensile powers. The second pair of arms are about the same size as the first, but they appear to possess no prehensile capability; the hand is longer than the wrist, and dilated on the superior mar-

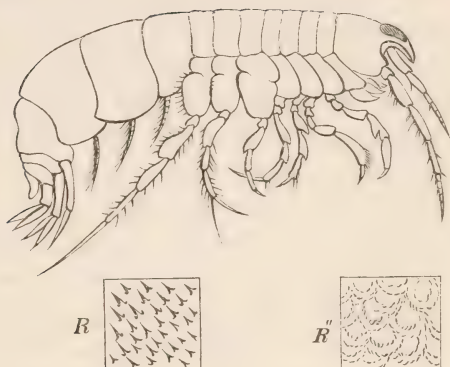
gin, which is furnished towards the distal extremity with a copious brush of hair; the finger is straight, and appears not to have the capability of being inflexed against the hand. The first two pairs of walking legs are uniform in shape, and carry a tuft of hair upon the antero-distal extremity of the sixth joint. The fifth pair of legs are longer and more robust than the sixth. The coxa has the anterior lobe much deeper than the posterior. The sixth pair of legs are rather longer than the preceding, and more slender; whilst the seventh is considerably longer and still more slender, having the foot considerably increased in length, and the finger very long, being longer than the foot, and quite straight. The caudal appendages are nearly equal in length; the last pair are rather more foliaceous than the two preceding pairs; and the terminal plate is squamous, round, and dorsally concave.

The animal is very transparent, being slightly corneous; under the microscope the structure of the skin appears like a series of cells, overlapping each other like the scales of fish; the margin of each scale is defined by a double row of short straight lines or spots, and a black spot marks the centre of each scale. The whole surface of the skin of the posterior part of the animal is, moreover, superficially covered with a fine fur, formed of processes of the integument, broad at the base, and exquisitely fine at the apex. The anterior portion of the animal is free from this fur.

The specimen from which our figure was taken is a female, and laden with ova. We took it from among some trawl-refuse, brought in from the neighbourhood of the Eddystone. It has since been sent to us from the Moray Frith, by the Rev. G. Gordon; and from Banff by Mr. Edward.

AMPHIPODA.
NATATORIA.

PHOXIDES.



WESTWOODILLA HYALINA.

Specific Character. Eye prominent. Superior antennæ shorter than the peduncle of the inferior. In the microscopic structure of the skin there is no central spot or nucleus to each cell.

Length $\frac{6}{20}$ inch.

Westwoodilla hyalina. SPENCE BATE, Cat. Amph. Brit. Mus. p. 103, pl. xvii. fig. 5.

THIS animal bears a considerable resemblance to the last species, but differs in several more or less important details. The eye is more clearly defined in form, and situated so closely beneath the skin, that it is raised upon the outer surface. It is long-ovate, and situated in the centre of the hood-like projection of the head. The superior antennæ are a little longer than the head, and have each joint of the peduncle gradually decreasing in length; the flagellum, which only consists of five or six articuli, is about the length of the last two joints of the peduncle. The inferior antennæ have the peduncle longer than the superior; the last three joints are subequal in length, and the flagellum, which consists of five

or six articuli, is not longer than the last joint of the peduncle. The arms are subequal, the first pair having the wrist inferiorly produced, and the hand long-ovate; while the second have the hand furnished, upon the anterior distal extremity, with a brush of hair; both arms, in fact, closely assimilate to those of *W. cæcula*, whilst the rest of the animal approximates so nearly to that species, that we should have described it as being but sexually different, had there not been a very decided alteration in the microscopic appearance of the skin. Like the previous species, most of the body of the animal is covered by a fine fur, which, we think, is somewhat of a finer character than that of *W. cæcula*, and deeper in the structure may be observed the arrangement of the cells on a similar plan. Each cell is marked by a double row of elongated dots, and regularly approaches the adjoining cell, like chain-armour; but the black spot which occupies the centre of each cell, and is so conspicuous in the previous species, is not visible in this, which therefore becomes still more transparent and clear. In fact, the species, whilst living, is scarcely perceptible, but for its great purple eye.

We procured this species from the refuse of trawlers, who had been fishing near the Eddystone Lighthouse.



AMPHIPODA.
NATATORIA.

PHOXIDES.

CEDICEROS.

Cediceros. KROYER, Tidskr. iv. p. 155 (1842-3).

Cedicerus. DANA, U. S. Explor. Exped. p. 933. SPENCE BATE, Cat. Amph.
Brit. Mus. p. 103.

Cephalon produced anteriorly. Eyes confluent. Superior antennæ without a secondary appendage. Gnathopoda subchelate. Posterior pair of pereopoda very long and slender.

THE head is produced and depressed anteriorly. The eyes are confluent, and situated before the antennæ. The upper antennæ are without a secondary appendage. The arms are subchelate: the first pair are a little longer than the second. "The first two pairs of walking legs are strong, and the last pair is very long and slender, almost filiform." (Kroyer.)

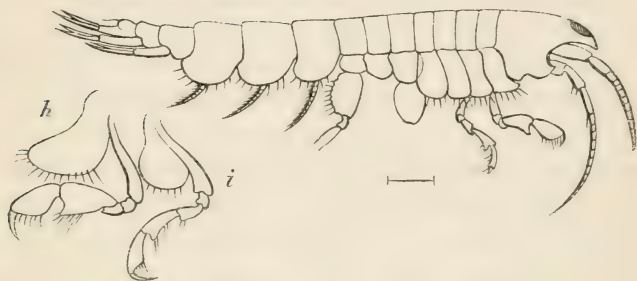
The only specimen of this genus that we have seen is imperfect; we, therefore, can only assume that the absent parts, like those present, correspond generically with the description given by Kroyer. In our specimen the eyes are visible, whereas Kroyer describes the animal as having none, but marks the assertion with a doubt.

This genus is in very close connection with *Westwoodilla*, from which it appears to differ only in having the second pair of gnathopoda subchelate.

It is to us a question of some doubt whether the species described by Dana belong to this genus. They certainly differ in the absence of the prolonged rostrum, and in the possession of two distinct lateral eyes.

AMPHIPODA.
NATATORIA.

PHOXIDES.



ÆDICEROS PARVIMANUS. N. S.

Specific character. Eyes confluent, placed near the apex of the rostrum. Superior antennæ as long as the cephalon. Inferior antennæ one-third longer. First pair of gnathopoda longer than the second.

Length, $\frac{7}{20}$ inch.

THE head is large and deep, being as long as the first four segments of the body, and reaching nearly as deep as the lower margins of the coxæ. The eyes are confluent, and appear as a single organ, situated at the anterior extremity of the head, where it is produced into a hood-like rostrum. The superior antennæ are scarcely longer than the head, and the flagellum is scarcely shorter than the peduncle. The inferior antennæ are half as long again as the superior, and the peduncle is about the same length as the flagellum. The first pair of legs are simply subchelate, and not largely developed; the wrist is quite as large as the hand, and has the infero-anterior angle produced anteriorly; the hand is ovate, has the palm oblique, but not distinctly defined, and is armed with strong hairs. The second pair of legs are more slender than the first; the wrist is quite as long as the hand, and has the infero-anterior margin slightly produced; the hand is long-

ovate, having the palm very oblique, and furnished with a few very slight hairs. The rest of the appendages of the only specimen of this species which we have seen are mutilated.

Kroyer in his generic description states that both pairs of hands are very large, which must be assumed to be a specific, rather than a generic character, and hence, since his genus was founded upon the observation of a single species, this character belongs to *Ædiceros saginatus* alone. In this respect our species differs from that of Kroyer, as neither of the hands can be described as being large, and the second is decidedly smaller than the first.

It is in the collection of the Rev. A. M. Norman, having been taken by him, and Mr. J. Gwyn Jeffreys, in from seventy to ninety fathoms of water, sixty miles east of the Shetlands, in the summer of 1861.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—MONOCULODES. STIMPSON.

- Monoculodes.* STIMPSON, Marine Invert. Grand Manan, p. 54. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 104.
Westwoodea (pars). SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58.
Kröyera. SPENCE BATE, Synop. &c. Ann. Nat. Hist. Feb. 1857, 2 ser. xix. p. 140 (but not of this work).

Generic character. Cephalon produced and depressed anteriorly. Eyes coalesced into one, situated above and anterior to the superior antennæ. Superior antennæ without a secondary appendage. Gnathopoda subchelate, carpi antero-distally produced to the extremity of the inferior margin of the propoda. First pair more robust than the second. Second having the propodos longer than the propodos of the first pair. Posterior pair of pereiopoda much longer than the others. Posterior pair of pleopoda biramous. Telson squamiform, entire.

THE head is rounded above, and the anterior dorsal surface is considerably produced and depressed. The eyes are deep-seated, converging together, so as to appear to be but a single organ, placed horizontally above, and still more forward than the base of the superior pair of antennæ. The antennæ are simple in their character, the superior pair not being furnished with a secondary appendage. The mandibles are furnished with an appendage. The first two pairs of legs are complexly subchelate, having the wrist produced anteriorly along the inferior margin of the hand, which is much longer and not so broad in the second as in the preceding pair of legs. The last pair of legs are considerably longer than any of the other pairs, and terminate in a long

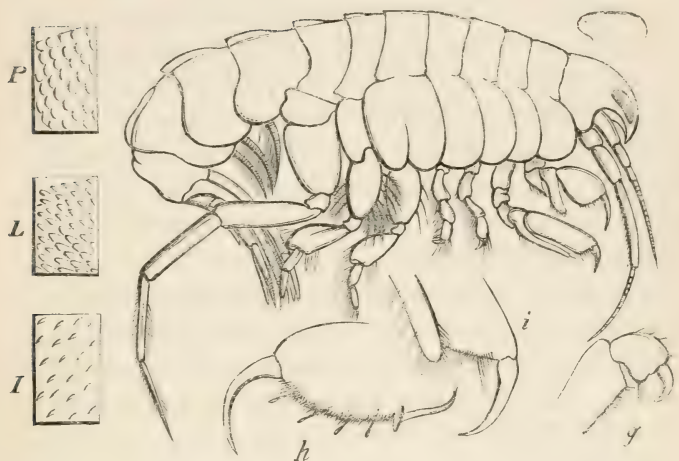
straight finger. The last pair of caudal appendages are double-branched, and the terminal plate is squamiform.

The genus was first described by Mr. Stimpson, in his "Synopsis of the Marine Invertebrata of Grand Manan," in which he says that it differs from *Ædiceros* in the form of the hands. We have not, until recently, had an opportunity of seeing an undoubted specimen of the latter genus. This, however, corroborates our previously-expressed opinion, which was based upon the circumstance that Kroyer, in his description of the genus, did not in any way refer to the prolonged carpus of the first two pairs of legs: we, therefore, agree with Stimpson, and retain the genus *Monoculodes*, to which *Ædiceros* appears to be closely allied. *Monoculodes* assimilates also to *Westwoodilla*, in which, however, the second pair of legs are not in the least degree subchelate.

This genus was first described in this country by Mr. Spence Bate, in "A Synopsis of the British Amphipoda," under the name of *Kröyera*, with *Westwoodea carinata* (Brit. Assoc. Rep. 1855, p. 58) as its type. Being, however, identical with *Monoculodes* of Stimpson, the name of *Kroyera* has been sunk for the present genus. In order, however, that the name of the distinguished Danish carcinologist should remain associated with the present class, it has been transferred to a subsequent genus.

AMPHIPODA.
NATATORIA.

PHOXIDES.



MONOCULODES CARINATUS.

Specific character. Body having the last two segments, and the tail having the first three segments, dorsally raised into a keel, increasing in size posteriorly, and ending abruptly in each segment.

Length $\frac{1}{2}$ inch.

- Westwoodia carinata.* SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58
Kröjera carinata. SPENCE BATE, Synop. Ann. Nat. Hist. Feb. 1857,
 2 ser. xix. p. 140.
Monoculodes carinatus. SPENCE BATE, Cat. Crust. Brit. Mus. p. 104

THE head is considerably produced anteriorly, and much deflexed. The eye is long-oval, deeply seated, and rather dimly defined, lying in a plane corresponding with the dorsal surface. The superior pair of antennæ do not reach further than the extremity of the peduncle of the inferior pair; their peduncle reaches a little beyond the anterior extremity of the head; and the flagellum is about the length of the peduncle. The inferior pair of antennæ are about one-third the length

of the animal; and have the last joint of the peduncle as long again as the preceding, and rather longer than the flagellum. The foot-jaws are tolerably robust, and terminate in a triangular hand, the broadest part being near the finger, where it forms a kind of palm, against which the finger, which is extremely curved, is capable of impinging. The first pair of legs are not very long, they have the metacarpus produced inferiorly to a sharp point; and the wrist is considerably produced anteriorly, in the form of a plate, corresponding to the inferior margin of the hand; the hand is oval, having a convex palm obliquely placed, and defined by a solitary, short, obtuse spine,—it is armed throughout its length with a number of short posteriorly-directed hook-like spines, which are flanked by several bunches of straight, uneven, lengthened hairs; the finger is curved, sharp, and free from any armature. The second pair of legs are longer than the first, but are constructed upon the same type; the wrist is anteriorly produced to a much greater length; the hand is long and narrow, being nearly four times as long as broad; the palm is short, slightly oblique, fringed with short, and a few long cilia, and defined by an obtuse rounded angle, beyond which the anterior extremity of the carpus advances; the finger is short, curved, clean, and sharp. The coxæ of the five anterior pairs of legs are as deep as the corresponding segments of the body. The third and fourth pairs of legs are formed upon the same type, and closely resemble each other, and are remarkable for having the hands dilated upon the backs, where they are furnished with a thick brush of hair, a peculiarity which appears to belong to this genus. The fifth pair of legs are much longer than the two preceding pairs,—they have the coxa two-lobed, and as deep as the coxa of the preceding legs;

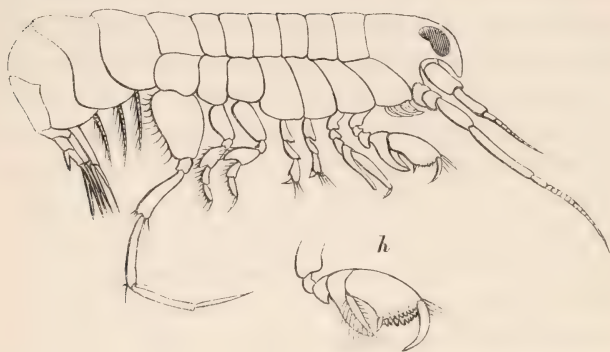
of legs; the third joint is short; the fourth reaches as far the thigh is oval, the metacarpus posteriorly dilated and distally produced behind; the wrist and hand subequal, straight, and the finger short and straight. The sixth pair closely resemble the fifth, except that the coxa is shorter, and the thigh is fringed with plumose hairs. The seventh pair of legs are more than twice the length of the preceding pair: the coxa is short, the thigh dilated, the metacarpus long and narrow, longer than the thigh; the wrist is as long as the metacarpal joint; the hand is a little shorter and more narrow than the wrist, and internally fringed with cilia; the finger is nearly as long as the hand, straight, ciliated, and tapering to a sharp point. The caudal appendages are long, reaching to nearly the same distance; their branches are generally free from hairs, and are styliform. The terminal plate is lanceolate, squamiform.

This species is very free from colour, except the eye, which is of a deep purple, but, under the microscope, the animal appears to be rough on the surface, an appearance due to a number of scale-like elevations of the skin. Under a power of about 300 diameters, the integument of the body of the animal appears to be covered with minute distant scales; they gradually increase and thicken, until they assume their greatest degree of number and character upon the anterior segments of the tail, and then again gradually decrease in size and importance towards the posterior extremity of the animal.

The first specimen which we received was sent to us by Mr. Edward, of Banff, who took it in that locality. It has since been procured by Mr. Gregor, from the stomach of a haddock, taken from about thirty or forty fathoms, near the same place.

AMPHIPODA.
NATATORIA.

PHOXIDES.



MONOCULODES STIMPSONI.

Specific character. Pleon not carinated; thighs of the sixth pair of legs not plumigeous.

Length, $\frac{5}{32}$ inch.

Monoculodes Stimpsoni. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 105, pl. xvii. fig. 3.

THE back of the animal has no perceptible carina. The head is advanced and depressed, but scarcely so much curved as in *M. carinatus*. The eye is undefined, and situated above, and rather in advance of, the point where the antennæ articulate with the head. The superior antennæ reach rather beyond the peduncle of the inferior; the first joint of the peduncle extends as far as the extremity of the head; the second joint is rather more than half the length of the first, and much slighter; the third joint is small, being scarcely a third the length of the second; the flagellum is slender, and scarcely the length of the peduncle. The inferior pair of antennæ are one-third longer than the superior, and reach as far as the seventh segment of the body; the first two joints are covered by the coxæ of the first pair

as the extremity of the peduncle of the superior; the fifth is but little longer than the fourth, and reaches nearly to the extremity of the flagellum of the superior pair; the flagellum is about the length of the last joint of the peduncle, having the first articulus equal to five of the succeeding, which are subequally short, and scarcely longer than broad. The first pair of legs are moderately large, larger in proportion to the second pair than in *M. carinatus*; the wrist is inferiorly produced to a broad plate, reaching nearly to the extremity of the inferior margin, and having its edge fringed with fine hairs; the hand is longer than the wrist; the superior margin forms, with that of the wrist, one continuous arcuate line; the inferior margin lies subparallel with the upper, but the hand is narrower near the wrist than towards the palm; the palm is convex, armed with two or three rows of short posteriorly-curved hooks, and is defined by a strong spine; the finger is about the length of the palm, arcuate, and sharply pointed. The second pair of legs have the wrist produced along the inferior margin of the hand to the extremity, where it meets and antagonizes with the apex of the finger; the hand is longer than that of the first pair of legs,—it is narrow near the wrist, and becomes still narrower at the distal extremity, where there is a scarcely-perceptible oblique palm; the finger is short, and only very slightly curved. The third and fourth pairs of legs have the hand widening towards the distal extremity, the dilated portion taking place anterior to the point where the finger articulates with the hand, and furnished with a copious brush of hair at the extremity: the fingers are quite rudimentary. The fourth and fifth pairs of legs resemble each other very closely; their coxæ are shorter than those of the anterior pairs of legs; their second joints are less enlarged than is

common in the order; the fourth joints are dilated posteriorly, and distally produced to a point—these and the two following joints are fringed with small hairs; the fingers are straight and posteriorly directed. The seventh or last pair of legs are very long, three or four times as long as the others; the coxa is quite as deep as that of the preceding legs; the second joint is about half as long as the preceding legs, considerably dilated, and the posterior margins fringed with hair; the third joint is short, the three following are subequally long and narrow; the finger is as long as the hand, short, straight, styliform, and anteriorly directed. The posterior pair of caudal appendages are not longer than the preceding, and have the branches longer than the peduncle. The central tail-piece is nearly as long as the peduncle of the last pair of caudal appendages.

We first took a mutilated specimen of this animal from some trawl-refuse, in the neighbourhood of Plymouth; it was from this imperfect animal that the original description, in the Catalogue of the British Museum, was made. The Rev. A. M. Norman has subsequently allowed us to examine a specimen which he procured on the coast of Northumberland. We have dedicated this species to our valued correspondent, Mr. Stimpson, the zoologist of the United States' Expedition to Japan, by whom the genus was established upon animals procured off the coast of the United States, and to whom we are indebted for many named species of his crustaceous discoveries.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—KROYERA.

Kroyera. SPENCE BATE, Cat. Amph. Brit. Mus. p. 106, but not of Synopsis
Brit. Amph. Ann. Nat. Hist., 2 ser. xix, p. 140, Feb. 1857.

Generic character. Like *Monoculodes*, but having the eyes apart, and the second pair of gnathopoda chelate.

THE head is produced and anteriorly depressed. The eyes are apart and distinct. The superior pair of antennæ are without a secondary appendage. The inferior are slightly longer than the superior. The first pair of legs have the hands tolerably robust; the wrist anteriorly produced along the inferior margin of the hand, until the tip reaches the lower edge of the palm. The second pair are longer than the first, and have the anterior extremity of the wrist produced along and extending beyond the inferior margin of the hand; the hand has the inferior angle produced anteriorly, so as to form, with the impinging finger, a perfectly didactyle claw. The third and fourth pairs of legs are uniform and subequal. The fifth and sixth pairs are uniform and subequal, being robust, and scarcely longer than the preceding pair. The seventh pair are very long, and terminate in a straight styliform finger. The caudal appendages are double-branched, and the central tail-plate is squamiform and single.

The species on which this genus was founded was first described as belonging to the same genus as *Monoculodes*, and under the name of *Kroyera*. But on dis-

covering that Stimpson's genus *Monoculodes* was evidently the same as part of the genus *Kroyera*, Stimpson's name was adopted for those species which evidently belonged to that genus; whilst that of *Kroyera* has been given to the following species, which could not be retained in it.

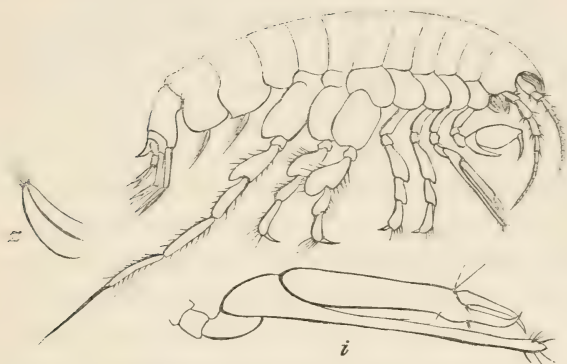
Since the above description has been in type, we have obtained an animal which coincides with the present genus in all its conditions, except that the eyes coalesce into a single organ, as in *Monoculodes*. We think it more convenient for the present to retain both in this genus until future observation shall enable us to determine the relative importance of this distinction.

The vignette represents a naval engagement when England put faith in her wooden walls.



AMPHIPODA.
NATATORIA.

PHOXIDES.



KROYERA ARENARIA.

Specific character. Eyes small, round. Antennæ subequal. First pair of gnathopoda as in *Monoculodes*. Second pair having the propodos long and narrow; the distal extremity of the carpus inferiorly produced beyond the apex of the dactylos. Posterior pair of pleopoda not so long as the preceding. Telson entire, dorsally concave.

Length, $\frac{2}{20}$ inch.

Kroyera arenaria. SPENCE BATE, Tyneside Field Nat. Club, vol. iv. pt. 1. p. 15, pl. ii. fig. 1. Cat. Amph. Brit. Mus. p. 106, pl. xvii. fig. 4.

THE body is smooth, and the head considerably produced and anteriorly depressed. The eyes are of moderate size, round, white, and placed behind the superior antennæ. The superior pair of antennæ reach to the fourth segment of the body, and have the first joint of the peduncle longer than the other two, which are short, and scarcely larger than the first articulus of the flagellum, which is about twice the length of the peduncle, and consists of about twelve or fourteen articuli. The inferior pair of antennæ reach one-fourth further than

the superior pair, and have the peduncle more conspicuous than that of the superior; only three joints of the peduncle are visible beyond the projecting lateral wall of the head,—these are subequal, and reach a little beyond the extremity of the peduncle of the superior pair; and the flagellum is scarcely longer than the peduncle. The coxæ are not very deep; and the first pair of legs have the hand oval, with the palm oblique; the tip of the infero-anterior process of the wrist extends a little beyond the inferior angle of the hand, and forms a point, against which the apex of the finger impinges, where it closes on the palm. The second pair of legs are longer than the first, and have the hand less robust,—it is long and slender, the margins being parallel, and the inferior angle produced anteriorly in a straight line, terminating in a sharply-pointed curve; the finger is narrow, sharp, and slightly curved, lying in a line continuous with the hand, and impinging against the inferior process, or thumb, only near the apex, or where the margins meet; the tips of the finger and thumb then cross each other. The wrist is short and narrow, and the anterior extremity is inferiorly produced into a long narrow process, that reaches beyond the apex of the claw, where it is slightly dilated or lobed, and tipped with a few hairs. The two next pair of legs are similar, and of the same length,—they are longer and a little stouter than the second, with the hands dilated anteriorly, similar to those in *Westwoodilla* and *Monoculodes*, and having the anterior distal extremity covered with a thick brush of hair; the fingers are short, strong, and directed backwards. The two succeeding pairs of legs are also similar to each other: they have the thighs oval, the metacarpal joints posteriorly dilated and inferiorly produced; the wrists and hands of nearly the same length, and fringed

with hair; the fingers are short, stout, and directed forwards. The last pair of legs are very long,* having the thigh oblong, the metacarpal joint posteriorly dilated and inferiorly produced, but not so largely as in the preceding pair; the hand is long and straight; and the finger is very long, straight, styliform. The caudal appendages are double-branched, the posterior pair having the peduncle much shorter than that of the others. The terminal plate is single, scale-like, dorsally cupped, and tipped with a few hairs.

The first specimen which we received of this species was sent to us by Mr. Albany Hancock, who took it on the beach near Sunderland, near the spot given in the vignette (p. 176), which was kindly drawn for this work by Miss M. Hancock.

This crustacean formed the subject of observation by Mr. Hancock, on account of the tracks which it makes in the sand, described in his "Memoir on Vermiform Fossils," read at the Meeting of the British Association at Leeds, September 22nd, 1858, and published in the "Annals of Natural History," ser. 3, vol. ii., as well as in the "Transactions of the Tyneside Field Naturalists' Club," vol. iv. pt. 1, for 1858.

Mr. Hancock says that the track of this species "is in the form of a narrow wedge-shaped furrow, about two-tenths of an inch wide, with margins occasionally a little elevated. Its windings are very capricious, irregularly rounded, frequently abruptly angulated, and sometimes, for a considerable distance, finely and regularly zig-zagged. This species (of tract) is often

* By an oversight, it has been figured with a joint too much, the hand being repeated; the space, in fact, between the extremity of the metacarpus and the base of the finger, should have been divided into two, instead of three portions.

found in close proximity to the broad form previously described [made by *Sulcator*]; but occasionally it occurs high up on the beach, and in pools and small hollows between the ripple-ridges. In such situations, however, it is not confined to the bottoms of the hollows, but likewise passes up the sides of the bordering ridges."

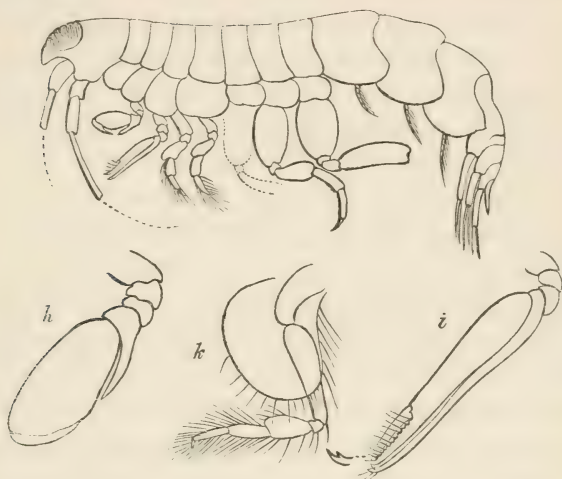
We have also received a specimen from Mr. Robertson, of Glasgow, which was taken by him at Cumbræ, N. B.

The vignette below is the sketch of Whitburn sands alluded to in the preceding page.



AMPHIPODA.
NATATORIA.

PHOXIDES.



KROYERA ALTAMARINA. N. S.

Specific character. Eyes confluent, and placed anterior to the superior antennæ. Second pair of gnathopoda having the inferior angle of the carpus produced anteriorly, scarcely beyond the apex of the dactylos.

Length $\frac{1}{4}$ inch.

THE head is anteriorly produced and depressed; the segments of the body are shorter than the three anterior segments of the tail. The first two segments of the tail are somewhat elevated posteriorly, giving a slightly-imbricated appearance to that portion of the back when viewed laterally. The eyes are fused into a single organ, as in *Monoculodes*. The antennæ are injured in the only known specimen, but the second joint of the superior antennæ is much more slender than the first; but in the inferior, the first three are equally stout, whilst the fourth is more slender, and as long as the two preceding. The first pair of legs do not differ from those of *K. arenaria*. The second pair have the hand

similarly formed to that of *K. arenaria*, but the carpal process is not quite so long, and ends in an upturned point; the digital process of the hand is also curved at the apex, and terminates in two small dental processes; the finger is long, slightly curved, and the apex reaches as far as the extremity of the carpal process, against which it appears to be able to impinge. The next two pairs of legs resemble each other, differing from those of *K. arenaria* only in being furnished with more hairs, which extend on both margins to a considerable extent. The fifth pair of legs are wanting in our single specimen, but we suppose them to resemble the seventh pair, and if so, the metacarpus is not quite so largely lobed as in *K. arenaria*. The seventh pair of legs have lost the distal joints, but those that remain indicate parts of a long limb. The caudal appendages have not been closely examined, but they appear to correspond very nearly with those of *K. arenaria*.

It is only after much deliberation that we have determined to embrace this monocular form in the same genus with a binocular species. The very close resemblance in the general detail of the two animals induces us to consider that the variation in the organs of vision may be sexual, or dependent upon certain altered physical conditions. We have little doubt but that, like its nearly *K. arenaria*, this species is a burrower; but whilst the habitat of the former is on the sea-beach, where the light is strong, that of the latter is under a pressure of from seventy to ninety fathoms of water, where the light can scarcely penetrate, even should the creature not plough its way beneath the soil.

The specimen from which this description and figure are taken is in the collection of the Rev. A. M. Norman, who dredged it sixty miles east of Shetland.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—AMPHILOCHUS.

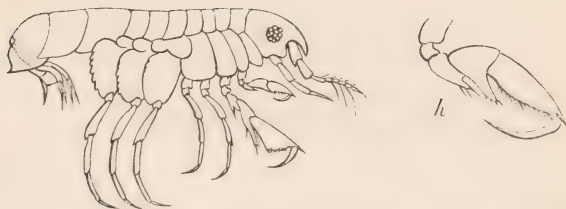
Amphilochns. SPENCE BATE, Cat. Amph. Brit. Mus. p. 107.

Generic character. Cephalon anteriorly produced. Eyes two. Superior antennæ without a secondary appendage. Gnathopoda subchelate, each having the carpus infero-anteriorly produced.

THE head in this genus is produced considerably in advance, and curved downwards. The eyes are two distinct organs, and are situated in their normal position, between the superior and inferior antennæ. The superior antennæ are tolerably robust, somewhat longer than the inferior pair, and not furnished with a secondary appendage. The inferior antennæ are more slender than the superior. The arms are furnished with subchelate hands, but those of the second pair are larger than those of the first pair: both are, however, remarkable for the extension of the infero-anterior angle of the wrist. In this they approximate to the genus *Monoculodes*, but the form of the eyes appears to warrant their generic separation. The recent discovery, however, of a species of *Kroyera*, which differs from the type of the genus in little else than in the character of these organs, induces us to believe it possible that future research in this branch of natural history may establish a closer alliance between *Amphilochns* and *Monoculodes*.

AMPHIPODA.
NATATORIA.

PHOXIDES.



AMPHILOCHUS MANUDENS.

Specific character. Second pair of gnathopoda having the propodos triangular; the superior distal angle being produced beyond the articulation of the dactylos. Middle joints of the flagellum of the superior antennæ furnished beneath with elongated hairs.

Length, $\frac{2}{25}$ inch.

Amphilochus manudens. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 107, pl. xvii. fig. 6.

THE head is anteriorly produced and depressed, but not incurved. The segments of the body are not more than half the length of those of the anterior half of the tail. The eyes are round, and not very large. The superior antennæ are longer than the inferior; the flagellum is not so long as the peduncle. The inferior antennæ are more slender than the superior, but the peduncle reaches almost as far as that of the superior; the flagellum is scarcely longer than the last joint of the peduncle. The first pair of legs are rather small, and the infero-distal extremity of the wrist scarcely reaches to half the length of the hand; the hand is long and narrow, the palm, fringed with small hairs, extends the entire length of the joint, and is subparallel with the upper margin, which is produced beyond the point where the finger articulates with the hand; the finger is long

and slender, more than usually bent, and reaches so far that, when closed, it impinges against and antagonizes with the produced extremity of the wrist, thus forming a complex hand. The second pair of legs are longer and stouter than the preceding; the wrist has the antero-inferior angle more elongated; the hand is triangular, the lower margin gradually diverging from the upper, the upper being the longer, and extending, in a sharp tooth-like process, beyond the articulation between the hand and the finger; the palm is slightly convex, and somewhat crenulated; the finger is sharp and curved, and the extremity reaches the ciliated apex of the produced wrist. The remaining appendages offer no material character. They are rather slender, and all nearly of the same length. The middle caudal plate is lanceolate.

This animal, of which we have only seen a single specimen, was sent to us by our valued correspondent, Mr. David Robertson, of Glasgow, who states that he had seen a second individual. It was taken by him from the roots of *Laminaria*, in a few fathoms of water, at Cumbræ, Scotland. Its colour, when it reached us, was claret-red.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—DARWINIA.

Darwinia. SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58. Ann. Nat. Hist.
1 ser. xix. 141, Feb. 1857. Cat. Crust. Amph. Brit. Mus.
p. 108.

Generic character. Cephalon produced anteriorly. Superior antennæ without a secondary appendage. Gnathopoda smaller than the pereiopoda, subchelate. Pereiopoda subequal; dactyla powerful. Posterior pair of pleopoda biramous. Telson single.

THE head of this genus is produced anteriorly to a point. The body is arched, and the segments subequal. The third segment of the tail is remarkable for being not so deep as the preceding, a feature which exhibits an approximation to the character of *Oxycephalus*, and other genera among the *Hyperina*. The eyes are round, and situated at the lateral margins of the head, between the superior and inferior antennæ. The superior antennæ are subequal to the inferior, somewhat more robust, and not furnished with a secondary appendage. The first two pairs of legs are small, and imperfectly subchelate, the second being a little larger than the first, but neither of them is as large as the true walking legs, all of which are about the same length, rather short, but very robust and strong, each terminating in a long, stout, slightly-curved, sharp finger. The caudal appendages are biramous, and the terminal piece consists of a single plate.

This genus bears a close resemblance to Kroyer's de-

scription of the genus *Lafystius*, (Tidskr. 1 ser. vol. iv. p. 156,) from which it differs chiefly in the form of the second pair of legs, which, in the latter genus, are described as having the finger sublaminar, with the apex somewhat setose, we presume, as in *Callisoma*. Their habits also appear to be similar.

This genus is named in compliment to the distinguished author of the "Monograph on the Cirripedia," one of the most complete works of the kind ever published.

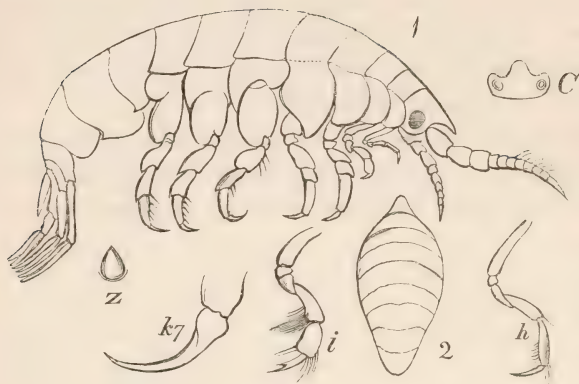


FRIGATE BEFORE THE WIND, SECOND-RATE AND FRIGATE GOING FREE.



AMPHIPODA.
NATATORIA.

PHOXIDES.



DARWINIA COMPRESSA.

Specific character. Cephalon produced to an obtuse point. Fourth segment of the pleon considerably narrower than the third. Superior antennæ longer and stouter than the inferior.

Length $\frac{7}{20}$ inch.

Darwinia compressa. SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58. Ann. Nat. Hist. 1 ser. xix. p. 141, Feb. 1857. Cat. Amph. Crust. Brit. Mus. p. 108, pl. xvii. fig. 7. WHITE, Hist. Brit. Crust. p. 176.

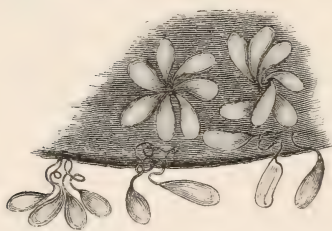
THE head is produced anteriorly to an obtuse point. The body is much distended, and increases in breadth to the third segment, whence it as gradually decreases posteriorly. The tail is narrow, with the third segment shorter than the preceding; the three last segments are extremely short, and generally lie folded, closely compressed, beneath the body of the animal, a circumstance which suggested the specific name. The eyes are round, and situated between the superior and inferior antennæ. The superior antennæ are about one-fourth the length of the animal, but longer and more robust than the inferior;

the peduncle is not longer than the flagellum. The inferior antennæ are scarcely longer than the peduncle of the superior. The first pair of legs are very small, and are generally so closely folded beneath the animal that they are with difficulty examined; the wrist and hand are subequally long, and very slight; the finger is long and slender, and capable of being shut upon the inferior margin of the hand. The second pair of legs are but a little larger than the first, and have the wrist longer than the hand; the hand is truncate, the palm being at nearly right angles with the inferior margin; the finger is long, and furnished with a single subapical tooth, giving it the appearance of a somewhat forked extremity. The walking legs are very robust; the coxæ gradually increase in depth from the first to the fourth, which is produced downwards to an obtuse point. All the walking legs are nearly equal in length and strength, and each terminates in a strong pointed hook-like finger, which Liljeborg not inaptly, in his description of *Lafystius*, compares to the claws of a feline mammal. They are long and powerful organs, and are indicative of parasitic habits. The three posterior pairs of caudal appendages reach to about the same length, and are very free from hairs. The tail-piece is lanceolate in its form.

This species was first taken by Mr. Edward, of Banff, at the entrance of the Moray Frith, whence also we have received specimens from Mr. Gregor, of Macduff. Mr. Loughrin has also sent us specimens from Polperro. These last were as white as writing-paper, and in this respect differed from those received from the Moray Frith, which were of a brown hue. After being kept a short time, the Cornish individuals assumed the colour of the North British specimens, hence we may assume white to be the

natural colour. Mr. Loughrin says, that his specimens were procured either from the throat of a cod-fish, or from the skin of the common dogfish (*Squalus acanthias*). The natatory legs of these specimens were thickly covered with a species of *Vorticella*, a circumstance which would suggest that they were animals of sluggish or quiet habits, rather than living on the surface of the fast-swimming dogfish; whilst their peculiar colour would induce the belief that they inhabited a sheltered and dark position, such as that of the throat of the codfish rather than the free ocean.

The vignette represents a group of the Infusoria which infest this amphipod.



AMPHIPODA.
NATATORIA

PHOXIDES.

Genus—SULCATOR.

- Sulcator.* SPENCE BATE, Ann. Nat. Hist. vol. xiii. p. 504, 1854; xix. p. 140. Rep. Brit. Assoc. 1855, p. 58. Cat. Amph. Brit. Mus. p. 112. WHITE, Hist. Brit. Crust. p. 174. GOSSE, Marine Zool. p. 142.
- Bellia.* SPENCE BATE, Ann. Nat. Hist. vol. vii. p. 318, 1851.

Generic character. Cephalon anteriorly produced. Gnathopoda small, imperfectly subchelate. Pereiopoda having the dactyla obsolete, most of the joints squamously developed.

THE head is developed anteriorly, and produced centrally to a point. The body of the animal is much distended, the centre, however, not being materially wider than the other portions. The third segment of the tail is remarkably long, and has the lateral walls considerably developed, so that the three posterior segments of the tail, together with their appendages, lie folded within it, seldom appearing extended.

The eyes are small. The superior antennæ are furnished with a secondary appendage. The coxæ are large. The arms are feeble and imperfectly subchelate. The walking legs have all the joints developed in the form of large plate-like scales, except the fingers, which are represented by a few stout spines. The last pair of caudal appendages are double-branched, and the central tail-piece is single, but cleft.

This genus bears a near resemblance to that described by Say, under the name of *Lepidactylis*, in the "Proceedings of the Academy of Philadelphia," vol. i. p. 2.

It may be that they are synonymous, but the very imperfect manner in which Say's genus is described, arising from the want of fixed homological names for the several parts of the animal, precludes us from expressing more than a supposition of their identity.

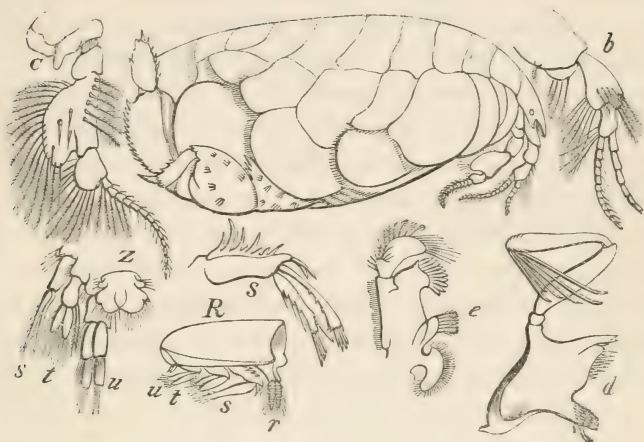
The habits of the only species of *Sulcator* appear to differ from those of the only species of *Lepidactylis* described, inasmuch as the former is very sluggish, and a burrower, whereas the latter is stated by Say to be very active, much resembling in its movements the water-beetles of the genus *Dytiscus*.

The accompanying vignette represents one of our favourite hunting-grounds, the Tor Rock in Oxwich Bay, near which our specimens of this genus were taken.



AMPHIPODA.
NATATORIA.

PHOXIDES.



SULCATOR ARENARIUS.

Sand Furrow-maker.

Specific character. Body not compressed, three posterior segments of the pleon bent under and enclosed beneath the third. Antennæ subequal. Coxæ of the pereopoda largely developed. Basal joint of the three posterior pairs also largely developed; dactyla wanting, or only represented by stiff spines.

Length, $\frac{11}{25}$ inch (not including the inflected portion of the pleon).

Sulcator arenarius. SPENCE BATE, Ann. Nat. Hist. vol. xiii. p. 504 (1854) vol. xix. p. 140, 1857. Rep. Brit. Assoc. 1855, p. 58. Trans. Tyneside Nat. Field Club, vol. iv. p. 15, pl. ii. fig. 2, 1858. Cat. Amph. Brit. Mus. p. 112, pl. xviii. Gosse, Marine Zool. p. 142, f. 264. WHITE, Hist. Brit. Crust. p. 174.

Bellia arenaria. SPENCE BATE, Ann. Nat. Hist. vol. vii. p. 318, 1851. DANA, United States' Explor. Exped. Crust. p. 912.

THE upper portion of the head is projected anteriorly as a flat hood, but has an excavation on each side, corresponding to the superior pair of antennæ, while the centre terminates in a blunt point. Between the antennæ the integument also extends into a point, though not so

far advanced as the central one. The body is smooth, and not compressed. The third segment of the tail is very long, and the three posterior segments are inflected and inclosed beneath it. The eyes are small and round, and the superior antennæ are short,—about as long again as the head; the secondary appendage is nearly as long as the flagellum. The inferior antennæ are a little longer than the superior. The first two pairs of legs are small, slender, and feeble, scarcely subchelate, the fingers being almost rudimentary. All the others are more robust, and have the fingers wanting, being replaced by two or three stout spines. The second and third pairs have the wrists short, but as broad again as long, and the hands increase in breadth from the articulation to the distal extremity, somewhat in the shape of a pear. The hand is capable of being impinged against the wrist, thus forming an imperfect prehensile organ. The next three pairs have most of the joints broadly developed, and lie folded against the sides of the animal, somewhat resembling scale armour. The swimming legs are short, and the three caudal appendages are short and spinous. The terminal plate is single, but deeply divided, and each half is dilated so as to overlap the other. The animal is not very hairy, but the hairs it possesses are of very diversified forms, some simple, others toothed in a variety of ways, both in single and double rows, while others are plumose and ciliated.

This singular creature lives on the coast, on sandy shores, between the tide-marks, coming to the surface when the tide is in, and again burrowing beneath it when the ebbing waters leave the sand dry. We have observed that they generally make a furrow in the sand, about a foot long, at the extremity of which we took them about an inch beneath the surface.

Mr. Albany Hancock has paid considerable attention to the furrows made by this creature, and described them in a paper entitled "On certain Vermiform Fossils in the Mountain Limestone Districts of the North of England," published in the "Transactions of the Tyne-side Naturalist's Field Club," which was read at the British Association at Leeds in 1858.

The animal appears to be a very sluggish creature, since Infusoria attach themselves to the hairs of the natatory appendages.

In colour the animal resembles the sand in which it lives, and may readily be passed without recognition. Mr. Gordon states that the eyes were cream-coloured in the specimen which he found. We believe, on the contrary, that those which we took on the coast of Glamorgan had dark, if not black, eyes.

Specimens of this species in the British Museum were taken in the neighbourhood of Falmouth by Dr. Leach. It has been sent to us from the Moray Frith, having been picked up at Lossiemouth, on the sand from which the tide had just receded, by the Rev. Geo. Gordon; also from the coast of Northumberland, where it was found by Mr. Albany Hancock.

The specimen from which our figure was taken we took, in company with Mr. Matthew Moggridge and Mr. J. Gwyn Jeffreys, in Oxwich Bay, and we have also found it in Rhosilly Bay in Glamorgan.



AMPHIPODA.

NATATORIA.

PHOXIDES.

UROTHOE.

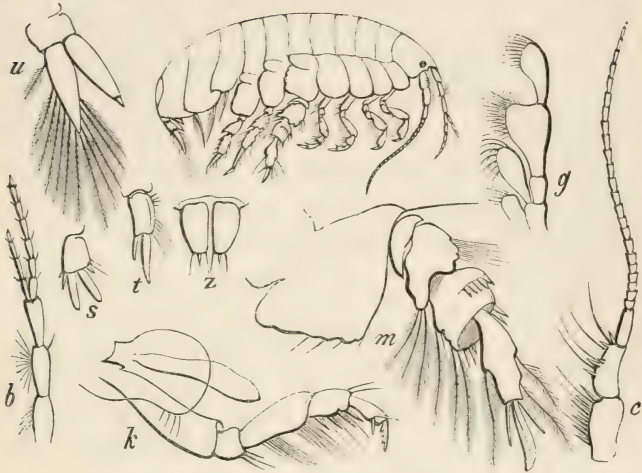
Urothoe. DANA, United States' Explor. Exped. p. 920. SPENCE BATE, Cat. Amph. Brit. Mus. p. 114.

Generic character. Body scarcely compressed. Eyes two. Superior antennæ having a secondary appendage. Gnathopoda subequal, subchelate. Pereiopoda having the dactyla constant. Posterior pair of pleopoda biramous. Telson double.

SOME of the species of this genus bear a resemblance to *Sulcator*. The body is but slightly, if at all, compressed. They have two eyes, which are always small and round. The superior antennæ have a secondary appendage. The coxæ are very large and deep; the fifth pair being smaller than the preceding. The first two pairs of legs are subchelate, and are furnished with well-developed fingers, as are all the other legs—a character sufficiently important to separate the species of this genus from that of *Sulcator*. The posterior pair of caudal appendages are two-branched, the branches being very long and foliaceous. The terminal plate is double.

AMPHIPODA.
NATATORIA.

PHOXIDES.



UROTHOE BAIRDII.

Specific character. Inferior pair of antennæ nearly half the length of the body, having the flagellum three times as long as the peduncle. Inner branch of the terminal caudal appendages naked.

Length $\frac{4}{30}$ inch.

Urothoe Bairdii. SPENCE BATE, Cat. Brit. Mus. p. 114, pl. xix. fig. 1.

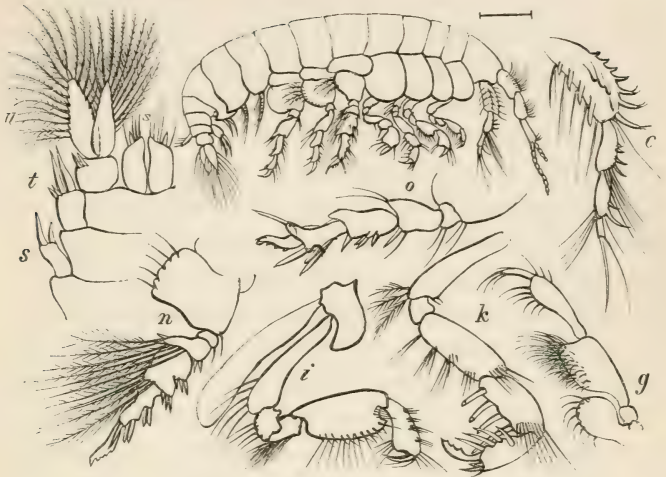
THE head is not anteriorly produced. The eyes are round and small. The superior pair of antennæ are about as long again as the head; the peduncle is about the same length as the flagellum; and the secondary appendage is about half as long as the flagellum. The inferior antennæ have the peduncle not reaching beyond the extremity of the peduncle of the superior, and furnished with a few small spines and long hairs: the flagellum is about three times as long as the peduncle; the articuli nearer to the peduncle are not longer than they are broad, whilst those towards the extremity gradually increase in length. The first two pairs of legs are uniform, the anterior pair being a little the larger;

the hands gradually increase in their diameter towards the palm, which occupies the anterior margin: it is convex, but its limit is not defined, but gradually rounded into the inferior margin, and slightly fringed with hairs. The third and fourth pairs of legs are also uniform, and furnished along the posterior margins of the wrists and hands with strong stiff spines, which appear to have the capability of being brought into contact with each other, and so of obtaining a prehensile power. The next pair of legs have the thigh gradually dilated, and the posterior margin of the succeeding joints furnished with long plumose hairs, and the anterior margin with fasciculi of spines: they terminate in a knife-shaped finger, the anterior margin of which is entire. The last two pairs of legs are uniform; they are furnished with a few short hairs and spines, and terminate in a straight finger. The antepenultimate pair of caudal appendages have the branches very unequal, whilst those of the penultimate are equal, as are also those of the ultimate, which are much longer, and have the inner branch covered with plumose hairs, whilst the outer one is clean, and tipped with a short spine at the extremity. The terminal plate or tail-piece is double, each division being tipped with a small central spine, flanked on each side with a minute hair.

We received this species from our kind correspondent, Mr. Gregor, of Macduff, who took it in the Moray Frith. It is named in compliment to the indefatigable author of the "History of the British Entomostraca."

AMPHIPODA.
NATATORIA.

PHOXIDES.



UROTHOE MARINUS.

Specific character. Superior antennæ longer than the inferior. Inferior antennæ having the flagellum uniarticulate. Second pair of gnathopoda with the palm slightly oblique. Both branches of the terminal caudal appendages plumose.

Length $\frac{1}{10}$ inch.

Urothoe marinus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 145, pl. xix. fig. 2.


Sulcator marinus. SPENCE BATE, Synop. Brit. Amph. Ann. Nat. Hist. ser. 2, xix, p. 140, Feb. 1857. WHITE, Hist. Brit. Crust. p. 175.

THIS species bears a close resemblance to the preceding in its general aspect, but may readily be detected from it by the shortness of the inferior antennæ. The superior antennæ are about one-fourth of the length of the animal, and have a flagellum scarcely longer than the last joint of the peduncle. The inferior antennæ scarcely reach beyond the extremity of the peduncle of the superior. The first joint of the peduncle is surmounted by three longitudinal rows of spines, each

spine successively increasing in length to the distal extremity of the joint; the flagellum consists of but a single articulus tipped with two long hairs. The first pair of legs are smaller than the second; the wrist is longer than the hand, and is inferiorly produced anteriorly, but not to any very great extent; the hand is narrow, but slightly increasing in diameter anteriorly; the palm is not defined, and the finger is long and curved. The second pair of legs are larger than the first, but differ not in any very great extent of form; the wrist has the inferior margin more decidedly convex, and is fringed with two rows of hairs equidistantly apart; in one row the cilia are directed anteriorly, and in the other they are directed posteriorly, and the distal margin is excavated; the hand increases in breadth anteriorly; the palm is slightly concave, but its limit is imperfectly defined, the inferior angle being rounded off, and furnished with a fasciculus of hairs. The third and fourth pairs of legs resemble each other; they are chiefly peculiar for having the wrist and the hand posteriorly furnished with strong blunt spines; those that are placed nearest to the distal extremity are the longest in each joint, and are nearly as long and powerful as the finger. The hand appears to have the power of being able to be pressed back against the wrist, and the pressure of the spines between each other gives the organ an imperfect but strong prehensile power. In the fifth pair of legs the dilated thigh is of a square form, rather broader than long, and the posterior margin being crenulated, and fringed with a row of simple hairs. The rest of the leg is remarkable for long plumose cilia, which ornament the posterior margin, while the anterior is furnished with fasciculi of short strong spines; the finger is not curved, but has the anterior margin a

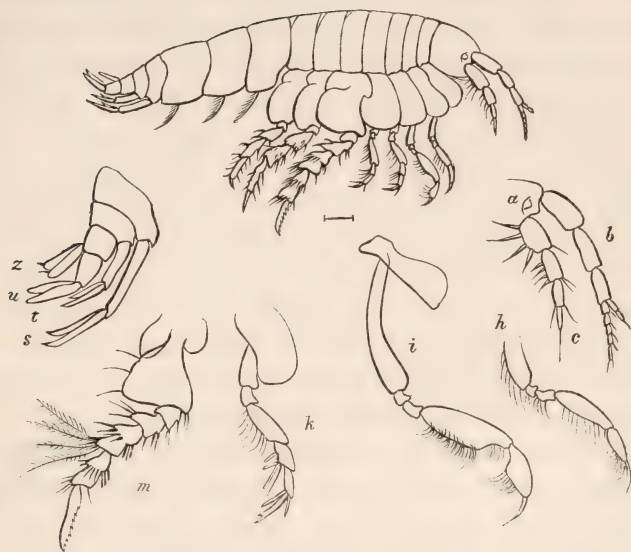
little dilated, and minutely serrated along the distal half. The seventh pair of legs have the thigh rounded; the rest of the joints posteriorly not furnished with hairs, but the anterior margin is armed with a few stout spines; the finger is crooked, and furnished with three bead-like tubercles on the anterior margin. The antepenultimate pair of caudal appendages have the branches very short, unequal in length, and styliform. The penultimate pair have the branches short, subequal, styliform, and free from hairs. The ultimate pair have the branches long, subequal, and plentifully furnished with plumose hairs. The central tail-piece has the approximate margin of each division nearly straight, and the external convex, and tipped with a few cilia and one stout spine.

We have received this species from the Moray Frith, where it was procured by Mr. Gregor, of Macduff, from the stomach of a haddock captured in about thirty fathoms of water: also from Mr. Edward, of Banff, and the Rev. Geo. Gordon, of Elgin. It has also been sent to us from Cumbrae, where it was taken by Mr. D. Robertson; and our lamented friend, the late Mr. Barlee, dredged it off the Shetlands.



AMPHIPODA.
NATATORIA.

PHOXIDES.



UROTHOE BREVICORNIS.

Specific character. Inferior antennæ not longer than the peduncle of the superior, and not furnished with spines on the superior margin. Branches of the terminal caudal appendages not hirsute.

Length $\frac{2}{30}$ inch.

Urothoe brevicornis. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 116, pl. xx. fig. 1.

THIS animal bears so close a resemblance to *Urothoe marinus*, that since it was originally described, we have much doubted whether it had not better have been described as a variety only. It may be that the distinctions are those of sex, but the habitats as yet recorded are very widely apart.

The antennæ are very similar to those in *U. marinus*, but the inferior are rather shorter, and are not furnished with those strong spines on the superior margin of the first joint of the peduncle, which form so remarkable a

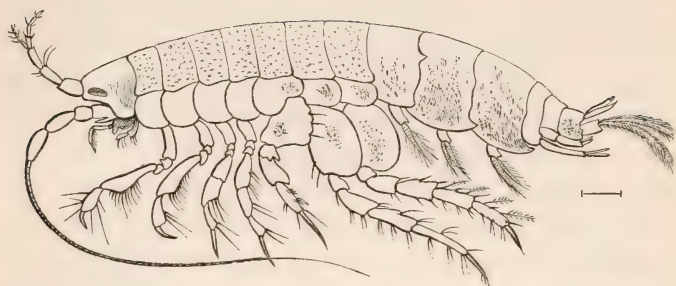
feature in *U. marinus*. The hands of the first two pairs of legs are rather more slender, and have not the antero-inferior margin of the wrist anteriorly produced, and the hands have the palms more oblique, and still more imperfectly defined. The third and fourth pairs of legs, although armed with spines, are not so strong as those of *U. marinus*. The dilated thigh of the fifth pair of legs is almost triangular, and has not the posterior margin crenulated; the plumose hairs adorning the posterior margin are reduced to a single tuft on the carpus; the finger is very long, and has the anterior margin entire, or imperfectly serrated. The last two pairs are nearly uniform, and have the posterior margins of the thighs imperfectly crenulated, and the fingers are straight and styliform. The caudal appendages differ from those of *U. marinus* in the greater length of the base, and in the branches of the antepenultimate pair reaching beyond those of the penultimate. The branches of the ultimate are also shorter, and not fringed with hairs. The middle tail-piece is long, naked, and obtuse.

This species was sent to us by our kind friend, Mr. M. Webster, from Tenby, where he took it with the dredge.

AMPHIPODA.

NATATORIA

PHOXIDES.



UROTHOE ELEGANS.

Specific character. Inferior antennæ nearly as long as the animal. Branches of the terminal caudal appendages very long and setose.

Length $\frac{4}{20}$ inch.

Gammarus elegans. SPENCE BATE, Rep. Brit. Assoc. 1855.

Urothoe elegans. SPENCE BATE, Synop. &c. Ann. Nat. Hist. 2 ser. xix. p. 145, 1857. Cat. Amph. Brit. Mus. p. 117, pl. xx. fig. 2. WHITE, Pop. Hist. Brit. Crust. p. 186.

THIS species much resembles *U. marinus*, but differs from it in the following important points:—the eyes are uniform; the superior antennæ are scarcely longer than the peduncle of the inferior; the flagellum of the inferior is very slender and long, being nearly as long as the animal. The rest of the animal scarcely offers any specific variation from *U. marinus*. Its colour is whitish buff, the anterior portion of the body being covered with small black dots, and the head, posterior coxæ, and bases of the hind legs, as well as the sides of the terminal segments of the body, beautifully mottled with pink.

The first specimen was taken from some trawl refuse, brought in from the neighbourhood of the Eddystone Lighthouse. Its extremely beautiful colouring struck us with delight, and suggested its specific name, more particularly if it should prove constant. A second spe-

cimen has been taken by Professor Kinahan, in Dublin Bay; and a third has been procured by the Rev. A. M. Norman and Mr. J. Gwyn Jeffreys, in from sixty to seventy fathoms, near the Outer Haaf Fishing Ground, off the Shetland Islands.

This species is very closely allied to *U. irrostratus*, which was taken by Dana in the Zooloo Sea. Nor is this the only instance in which we have observed a very near affinity between the Crustacea of our own seas and those of the antipodal regions.



AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—LILJEBORGIA.

Liljeborgia. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p 118.

Generic character. Cephalon but slightly produced anteriorly. Superior antennæ furnished with a secondary appendage. Gnathopoda large, subchelate, second larger than the first, inferior carpal angle anteriorly produced. Posterior pair of pleopoda biramous. Telson cleft.

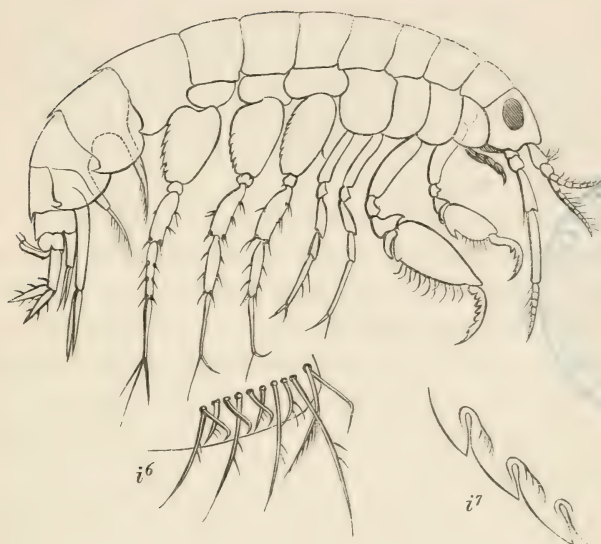
THE head is not anteriorly produced to half the length of the first joint of the superior antennæ. The segments of the body are nearly as long* as those of the tail. The eyes are large. The superior antennæ shorter than the inferior, and furnished with a secondary appendage. The first two pairs of legs have the hands largely developed, the second being the larger, and the inferior angle of the wrist is produced to a short distance along the inferior margin of the hand. The other legs are tolerably free from hairs, and have the fingers very straight. The last pair of caudal appendages have two branches, and the central tail-piece consists of a single plate, which is cleft at its apex.

This genus is named in compliment to the distinguished zoologist of the University of Upsala, Professor Liljeborg.

* The length of a segment is measured in the same direction as that of the body of the animal; the breadth is when it is measured from side to side.

AMPHIPODA.
NATATORIA.

PHOXIDES.



LILJEBORGIA PALLIDA.

Specific character. Inferior antennæ having the flagellum shorter than the last joint of the peduncle. Gnathopoda having the propoda ovate; dactyla internally serrated. Posterior pair of pleopoda with the rami shorter than the peduncle.

Length $\frac{4}{25}$ inch.

- Gammarus ? pallidus.* SPENCE BATE, Rep. Brit. Assoc. 1855, p. 55. Synop. in Ann. Nat. Hist. 2 ser. xix. p. 145, 1857. WHITE, Pop. Hist. Brit. Crust. p. 185.
- Liljeborgia pallida.* SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 118. pl. xx. fig. 5.
- Gammarus brevicornis.* BRUZELIUS, Scand. Amph. Gam. p. 62, pl. iii. fig. 11.

THE first, second, and fourth segments of the tail are furnished with a small dorsal tooth. The posterior margin of the third segment has a very distinct emargination just above the infero-posterior angle, which is formed into a small but distinct tooth. The eyes are large,

tolerably round, and black. The superior antennæ are about half as long again as the head; the peduncle is just the same length as the flagellum, but the first joint is longer than the other two; the flagellum is about half the length of the peduncle. The inferior antennæ have the peduncle quite as long as the superior antennæ, the last two joints being nearly of the same length, and about three times the length of the preceding. The first two pairs of legs are similarly formed, but differ considerably in size, the second having the hand more than twice as large again as that of the first; the wrist is inferiorly produced along the inferior margin of the hand; the hand is ovate, the palm occupying nearly the entire length of the inferior margin, without its extent being properly defined, the edge is furnished with a smooth margin, fringed laterally with two sets of hairs, the one directed anteriorly, with the tip suddenly directed posteriorly into a hook; the other, consisting of alternate long and short hairs, directed backward, each being furnished on the anterior margin with two small cilia; the finger is curved, and armed on the inner margin with a deeply-serrated edge. The next two pairs of legs are more slender, and shorter than any of the others. The last three have the thighs very oval, and the fingers very long, straight, and styliform. The penultimate pair of caudal appendages are shorter than those that precede or follow it. The last pair have the branches much shorter than the peduncle. The tail-piece is oval, and subapically furnished with two simple hairs.

This animal was first taken by us, in company with our valued friend Mr. T. P. Smyth, to whom we wish to express our obligation for having frequently placed his yacht at our disposal for dredging purposes. We

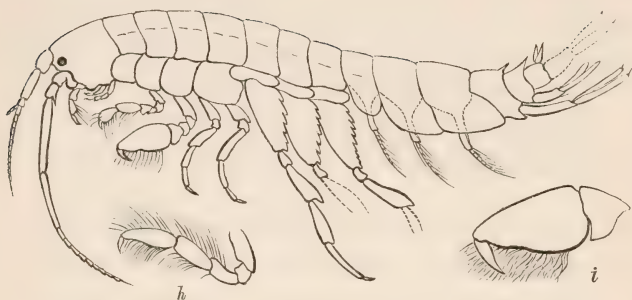
took several specimens on the eastern side of Drake's Island.

In the living animal the colour is very white, the back being stained with a rich crimson blotch, a circumstance that enabled us to identify every specimen at once. The hands possess a rosy hue, and a tinge of the same colour may be detected on many of the articulations of the legs.

Bruzelius, in his "Memoir on the Amphipoda of Scandinavia," has given the figure and description of a species of this genus, under the name of *Gammarus brevicornis*, which we consider to be identical with this, the only distinction being the shortness of the last joint of the peduncle of the lower antennæ, the greater relative length of the flagellum, and the less ornate character of the serrature of the fingers to the hands, the result probably of being examined with a less powerful lens. The specimens, described by Bruzelius, were taken on the western shores of Sweden.

AMPHIPODA.
NATATORIA.

PHOXIDES.



LILJEBORGIA SHETLANDICA. N. S.

Specific character. First and second segments of the pleon unarmed; fourth and fifth segments dorsally produced posteriorly into a small tooth. Secondary appendage of the superior antennæ very short. Inferior antennæ having the flagellum longer than the last joint of the peduncle. Dactyla of the gnathopoda unarmed.

Length $\frac{1}{4}$ inch.

THE head is not produced anteriorly. The dorsal surface of the animal is smooth, except a small tooth-like process, developed from the centre of the posterior margins of the ante- and penultimate segments of the tail. The eyes are small, round, and situated in their normal position on a lobe between the superior and inferior antennæ. The superior antennæ have the second joint of the peduncle longer than the first, the third joint very small, the flagellum reaching beyond the extremity of the penultimate joint of the peduncle of the inferior antennæ, and the secondary appendage extremely short. The inferior antennæ have the last two joints of the peduncle very long and subequal, and the flagellum is rather longer than the last joint of the peduncle. The first pair of legs have the hands not dilated, but rather tapering to the distal extremity, and the wrist is nearly as long as the hand. The second pair of legs have the

wrist short, and slightly produced inferiorly; the hands dilated, ovate, tapering from the base to the distal extremity, the palm being continuous with the inferior margin, and fringed with long hairs, a depression near the centre marking the extent to which the very short finger reaches. The finger of this and the preceding pair has the inner margin smooth. The two succeeding pairs of legs are small; the last three have the thighs, which gradually narrow from the base to the distal extremity, posteriorly serrated. The last pair of caudal appendages are wanting in all the specimens that we have seen. The central tail-piece is very deeply cleft.

Several specimens of this species have been taken by the Rev. A. M. Norman, in forty fathoms, near Whalsey Lighthouse, and in from two to five fathoms, in Outer Skerries Harbour, Shetland.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—PHÆDRA.

Phædra. SPENCE BATE, Quarterly Journal of Geol. Soc. 1853, p. 137.
Cat. Amph. Brit. Mus. p. 119.

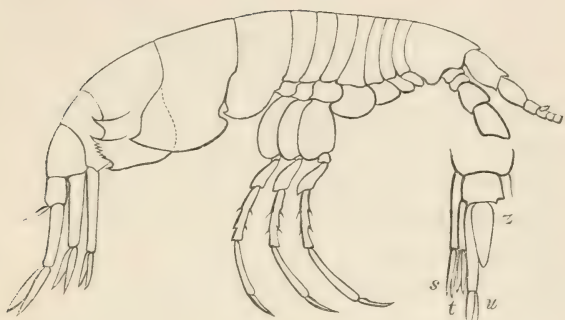
Generic character. Cephalon produced anteriorly. Segments of the pereion short, of the pleon long. Superior antennæ shorter than the inferior, furnished with a secondary appendage. Posterior pair of pleopoda considerably elongated, biramous. Telson simple or notched.

THE head is anteriorly produced, but not to so great an extent as in some of the preceding genera. The segments of the body are remarkably short, whilst those of the anterior half of the tail are extremely long. The eyes of the type were not observed. The superior antennæ are shorter than the inferior, and rather more robust; they are furnished with a secondary appendage. The coxæ of the legs are small. The last three pairs of caudal appendages are double-branched, the branches of each pair respectively being subequal, those of the last pair being considerably elongated. The central tail-piece is squamiform or notched.

This genus is founded on imperfect specimens.

AMPHIPODA.
NATATORIA.

PHOXIDES.



PHÆDRA ANTIQUA.

Specific character. Third segment of the pleon having the posterior margin toothed and minutely serrated. Superior antennæ furnished with a secondary appendage. Rami of the posterior pair of pleopoda equal. Telson lanceolate.

Length $\frac{4}{20}$ inch.

Phædra antiqua. SPENCE BATE, Quart. Journ. Geol. Soc. 1858, p. 137, pl. 6, fig. 8. Cat. Crust. Amph. Brit. Mus. p. 120, pl. 21, fig. 2.

THE head is anteriorly produced to a central point. The third segment of the tail has the inferior half of the posterior margin minutely serrated, the limits being bounded by a prominent tooth above and below. The superior antennæ have the first joint of the peduncle broader and longer than the second, and the second more so than the third, whilst the third is scarcely longer, though broader, than the first articulus of the flagellum; the secondary appendage consists of a single articulus, but the remainder may be broken away. The inferior antennæ have the joints of the peduncle that remain in the specimen before us as stout as those of the first joint of the superior. The coxæ of the first four pair of legs are deeper than those of the three posterior. The three posterior pairs of legs are subequal. The poste-

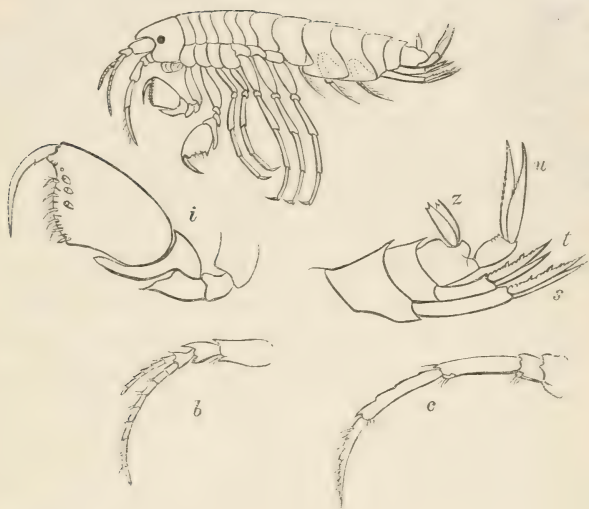
rior pair of caudal appendages are half as long again as the preceding. The telson is long and lanceolate.

The specimen from which this description is taken was communicated to us by the Rev. Geo. Gordon, who took it in the Moray Frith, and has been described in the article in the "Quarterly Journal of the Geological Society" above referred to, as the nearest approach, among recent Crustacea, to a fossil species found by Mr. Kirkby in the magnesian limestone of Durham, and described by him in the same work for 1857 (page 214) under the name of *Prosoponiscus problematicus*, Schlotheim.

The fossil species differs from the recent forms in this subfamily, in two circumstances. The eyes are prominent upon the surface, like those of some *Isopods*, and the anterior and deeper segments of the tail decrease in depth posteriorly, a condition which belongs to some species among the *Hyperiidæ*; thus exhibiting additional evidence that the relation between the *Phoxides* and *Hyperiidæ* is closer than that between the latter and the *Gammarides*.

AMPHIPODA.
NATATORIA.

PHOXIDES.



PHÆDRA KINAHANI.

Specific description. Dorsum of the three posterior segments of the pereon, and five of the pleon, centrally produced posteriorly, the last three into prominent teeth; sides of the third segment of the pleon simple. Telson notched.

Length $\frac{2}{30}$ inch.

Phædra Kinahani. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 119, pl. 21, fig. 1.

THE head is anteriorly produced into a point, curved downwards. The body has each segment posteriorly produced in the middle, the projection scarcely forming a tooth until the fourth and fifth segments, in which it becomes more distinctly marked. The tail has a similar tooth on the two anterior segments, and also upon the fourth and fifth, but none upon the third. The eyes are round. The superior antennæ are scarcely shorter than the inferior;

they are large at the base, the first joint is longer than the other two; the first two are produced anteriorly to a point upon the upper surface, and notched into a distinct tooth upon the inferior: the flagellum is longer than the peduncle, and the secondary appendage is about half the length of the primary. The inferior antennæ have the upper distal extremity of each joint produced into a tooth; the flagellum is not longer than the last joint of the peduncle, and consists of one long articulus, or, more probably, several are fused together, of which the upper margin alone shows any indication of the several joints. The first two pairs of legs are uniform, both in dimensions and shape; the wrist is anteriorly produced along the inferior margin of the hand; the hand is subtriangular, tolerably large, having the palm oblique, defined by a strong spine situated at the apex of an obtuse angle; the palm is likewise furnished with short hairs, similarly formed to those on the hand of *Liljeborgia pallida*. The walking legs are subequal, the two first being rather the shortest; the thighs of all are remarkably narrow. The ante- and penultimate pairs of caudal appendages have the upper margin of the outer branch serrated, being also marked at regular distances by a strong tooth. The ultimate pair are considerably longer than the preceding; the branches are of equal length, having their upper margins very slightly serrated. The middle tail-piece is notched, but to what extent we have not been able to determine.

This species was taken from a nullipore bank off the coast near Cumbrae, by Mr. David Robertson, who kindly sent it to us.

It is not improbable that this species may belong to a separate genus from *Ph. antiqua*, but all the parts of the latter, as far as known, correspond very nearly to

those of this species, except, perhaps, the middle scale of the tail. Possessing, however, only a single specimen, which had been mounted for the microscope before we received it, we have not been able, from its position, to ascertain the precise form of this appendage. We assume it to be single, with a central cleft; but a small notch at the extremity of each division is very constantly associated with a double tail-piece, so that it is not impossible that this may be found to be the case in the species now under consideration.

The colour of the animal, when received by us, was of a reddish yellow.

The accompanying vignette represents a view of Ailsa Crag, from a sketch kindly lent to us by our friend Dr. Scott of Melby, Shetland.



AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—ISÆA.

Isæa. MILNE-EDWARDS, Ann. Sci. Nat. t. xx. p. 380. Hist. des Crust. t. iii. p. 26. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 142, 1857. Cat. Amph. Crust. Brit. Mus. p. 122. WHITE, Pop. Hist. Brit. Crust. p. 179.

Generic character. Superior antennæ having a secondary appendage. Gnathopoda subchelate; second pair the larger. Pereiopoda subchelate. Posterior pair of pleopoda biramous. Telson cylindrical, single.

IN this genus the cephalon is not much produced anteriorly. The eyes are two. The superior antennæ are longer than the inferior, and furnished with a secondary appendage. The arms are subchelate; the hand of the second pair is larger than that of the first; all the legs are likewise subchelate, the distal extremity of the hands being broadly dilated on the side towards which the joints bend. The coxæ of the four or five anterior pairs of legs are deep. The last pair of caudal appendages are double-branched, and the central tail-piece is round and solid, the alimentary canal probably opening at its posterior extremity.

Dana has established a subfamily to receive this genus, together with *Anisopus* of Templeton, under the name of *Isæanæ*, based upon the subchelate condition of the walking legs. We do not perceive any advantage to be derived from this arrangement, since *Isæa* and *Anisopus* (which latter we consider to belong either to the genus *Amphithoë* or *Sunamphithoë*) cannot be embraced in the same subfamily; and it will be found that there are other species possessing a more or less perfectly marked subchelate condition of the walking legs, which cannot be associated with *Isæa*.

AMPHIPODA.
NATATORIA.

PHOXIDES.



ISÆA MONTAGUI.

Specific character. Eyes reniform. Superior antennæ one-half the length of the animal. Gnathopoda having the propoda ovate. Pereiopoda having the propoda with the distal extremity serrated.

Length, $\frac{4}{20}$ inch.

Isæa Montaguï. MILNE-EDWARDS, Ann. Sci. Nat. t. xx. p. 380. Hist. des Crust. t. iii. p. 26, pl. xxix. fig. 11. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Synop. Ann. Nat. Hist. 2 ser. xix. p. 142, 1857. Cat. Amph. Crust. Brit. Mus. p. 122, pl. 22, fig. 1. WHITE, Pop. Hist. Brit. Crust. p. 179.

THE eyes are not large, but kidney-shaped, and of a bright-red colour. The superior antennæ are nearly half the length of the animal, the flagellum being as long as the peduncle, and the secondary appendage having but three articuli. The inferior antennæ are not quite so long as the superior, and have the peduncle longer than the flagellum: the olfactory organs in this species are well developed. The first pair of legs are rather small, and have the palm of the hand very ob-

lique. In the second pair the hand is much larger, but of nearly the same form, with the palm very oblique, and defined by two small spines. The third and fourth pairs of walking legs are alike, and have the posterior distal extremity of the hand strongly serrated, as have likewise the three posterior pairs, but being reversed, the serration is upon the anterior distal extremity. The last pair of caudal appendages have the branches of the same length, and reach a little beyond the preceding. The central tail-piece appears more like a small segment of the animal than is usual; it is cylindrical, and surmounted by a small spinule.

This species was taken by Professor Milne-Edwards, off the island of Chausay, and named by him in honour of Colonel Montagu, the pioneer of British marine zoology. We have procured it from some refuse brought by the trawlers from the neighbourhood of the Eddy-stone. All our specimens were taken from the back and branchial chambers of *Maia squinado*; they seemed, indeed, to exist among the thick stiff fur on the carapace of this spider-crab as if they were in their accustomed habitat, their prehensile legs being peculiarly adapted for holding themselves on that animal.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—IPHIMEDIA.

- Iphimedia*. RATHKE, Beitr. zur Faun. Norwegens, Nov. Act. Leop. vol. xx.
p. 89 (1843). SPENCE BATE, Ann. Nat. Hist. 2 ser. xix.
p. 141, Feb. 1857. Cat. Crust. Amph. Brit. Mus. p. 123.
WHITE, Pop. Hist. Brit. Crust. p. 176 (not *Iphimedia*, Dana).
Microcheles. KROYER, Tidsk. Nat. sec. 2, vol. ii, p. 5.

Generic character. Cephalon produced anteriorly. Pereion distended. Pleon compressed. Eyes two. Antennæ simple. Third pair of siagonopoda not unguiculate. First pair of gnathopoda feeble; second also feeble, imperfectly subchelate. Pereiopoda robust, having large and powerful dactyla. Posterior pair of pleopoda biramous. Telson single, squamous, emarginate.

IN this genus the head is produced anteriorly. The body is dorsally rounded and laterally distended, while the tail is very rapidly narrowed. It is furnished with a small eye upon each side of the head. The antennæ are subequal, and without a secondary appendage; the organs attendant upon the mouth are considerably projected forwards. The first pair of legs are feeble, and have the fingers rudimentary; the second are likewise feeble, but terminate in an imperfectly chelate organ. The coxæ increase in depth to the fourth, which is produced inferiorly to a sharp point. The last three pairs of legs are tolerably strong, and terminate in powerful fingers. The last pair of caudal appendages are double-branched, and the telson is single, squamiform, and emarginate.

Our description differs from that of Rathke in a

small extent. He describes the second pair of gnathopoda as terminating in a simple non-prehensile form, whilst he figures them as seen in our drawing; and the first he calls chelate, whilst in the two species which we have had the opportunity of examining the finger is almost obsolete.

Dana has, in his valuable work on Crustacea, evidently confused this genus with *Atylus* of Leach, to which all his species, except perhaps *I. nodosa*, undoubtedly belong.

The following vignette represents the pier-head at Lynmouth, on the north coast of Devonshire.



AMPHIPODA.
NATATORIA.

PHOXIDES.



IPHIMEDIA OBESA.

Specific character. Cephalon anteriorly produced, but not much depressed. Last segment of the pereion, and three first of the pleon, furnished on each side of the dorsal central line with a posteriorly-directed tooth.

Length $\frac{8}{20}$ inch.

Iphimedia obesa.

RATHEE, Beitr. zur Faun. Norwegens, Nov. Act. Leop. vol. xx. (1843), p. 89, pl. iii. fig. 1. SPENCE BATE, Ann. Nat. 2 ser. xix. p. 141, Feb. 1857. Cat. Amph. Crust. Brit. Mus. p. 123, pl. xxii. fig. 2. WHITE, Pop. Hist. Brit. Crust. p. 176, pl. x. fig. 6.

Microcheles armata. KROYER, Nat. Tidskr. sec. 2, vol. ii. p. 5.

THE head, which is anteriorly produced, has the long projection not curved downwards. The last segment of the body and the first three of the tail are severally furnished with two dorsal teeth, one being on each side of the central line; the posterior margin of the third segment of the tail has likewise a strong tooth near the centre, and another at the infero-posterior angle. The eyes are somewhat reniform, and red in colour. The antennæ are subequal, and about one-fourth of the length of the animal. The first pair of legs are weak, and have the hand long, with the infero-distal extremity

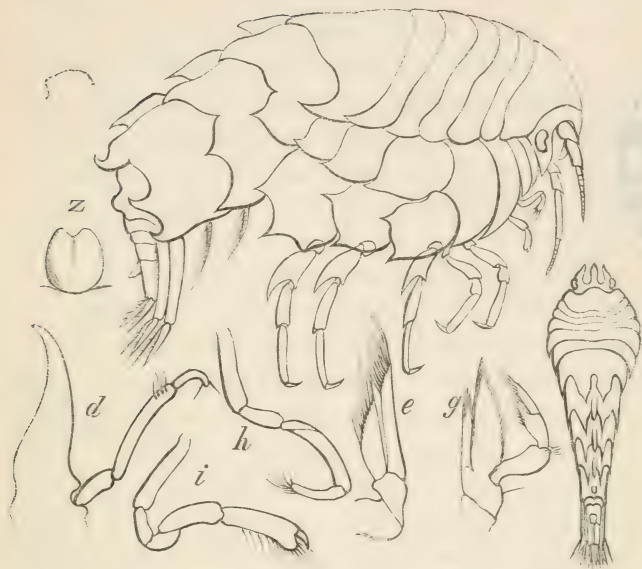
produced, the finger being rudimentary. In the more robust second pair the wrist is as long as the hand, which is produced and somewhat dilated towards the inferior angle of the distal extremity; the finger is small, subapical, and impinges against the hand so as to form an imperfectly chelate organ. The coxa of the fourth pair of legs has the upper portion of the posterior margin excavated, to receive the anterior lobe of the fifth pair of legs. The coxæ of the last two pairs of legs are produced infero-posteriorly to an angle; the thigh of the last pair has the lower half of the posterior margin deeply serrated. The last three pairs of caudal appendages are subequal in length, and terminate in equal styliform branches. The terminal plate is emarginate at the apex.

The colour of the animal appears to vary, but we are inclined to believe that it deepens in hue as it increases in age. The colour at first is yellow, with a few scattered cells of black pigment; these increase in number and dimensions until the animal becomes quite black.

It has been sent to us from Tenby, where it was dredged by Mr. W. Welsh; from the Moray Frith, where it was taken by Mr. Gregor; Mr. Barlee also took it in the Shetlands and Loch Fyne. In Belfast Bay it was dredged in twenty fathoms by Mr. Thompson; and we have dredged it on the north-west of Drake's Island in Plymouth Sound.

AMPHIPODA.
NATATORIA.

PHOXIDES.



IPHIMEDIA EBLANÆ.

Specific description. Cephalon anteriorly produced, and curved downwards. Last segment of the pereion, and first three of the pleon, furnished with a tooth on each side of the central line. First three segments of the pleon armed with a strong central dorsal tooth.

Length $\frac{8}{20}$ inch.

Iphimedia Eblanæ. SPENCE BATE, Dublin Nat. Hist. Rev. vol. iv. p. 229, pl. xvi. fig. 1 (1857). Proceed. Nat. Hist. Soc. Dublin, p. 28, pl. xvi. fig. 1 (1856-7). Ann. Nat. Hist. 2 ser. vol. xx. p. 525. Cat. Amph. Crust. Brit. Mus. p. 124, pl. xxii. fig. 3.

THE head in this species is very short, and has the anterior projection curved downwards and inflexed. The first and last segments of the body are longer than the intermediate. The last segment of the body and the first three of the tail have their posterior margins furnished with two latero-dorsal teeth similar to the preceding species, but the first three segments of the

tail are armed with a central dorsal tooth, directed posteriorly. The eyes are kidney-shaped. The antennæ are short, being scarcely one-sixth the length of the animal. The first pair of legs are slender and weak, with the finger obsolete. The second pair of legs are scarcely stouter than the first, and terminate in an imperfectly chelate organ. The walking legs are tolerably robust, and differ from those of *I. obesa* only in having the thighs of the last three pairs produced posteriorly in two sharp points or teeth. The last three pairs of caudal appendages are nearly of the same length, and the central tail-piece is emarginate at the apex.

Several specimens of this species were taken by Professor Kinahan, from the branchial cavities of *Rhizostoma Cuvieri*. The specimen from which our figure and description were taken is preserved, in an imperfect state, in the Dublin Museum. M. Guérin-Mèneville had some specimens in his collection, procured on the western coast of England.

The circumstance of this animal having been found inhabiting the gill-cavities of a Medusa establishes another link associating this subfamily more closely with the *Hyperina* than was at first presumed.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—OTUS.

Otus. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 125.

Generic character. Cephalon anteriorly produced. Pereion distended. Pleon compressed. Antennæ simple. Third pair of siagonopoda unguiculate. First pair of gnathopoda chelate; second subchelate. Posterior pair of pleopoda biramous. Telson single.

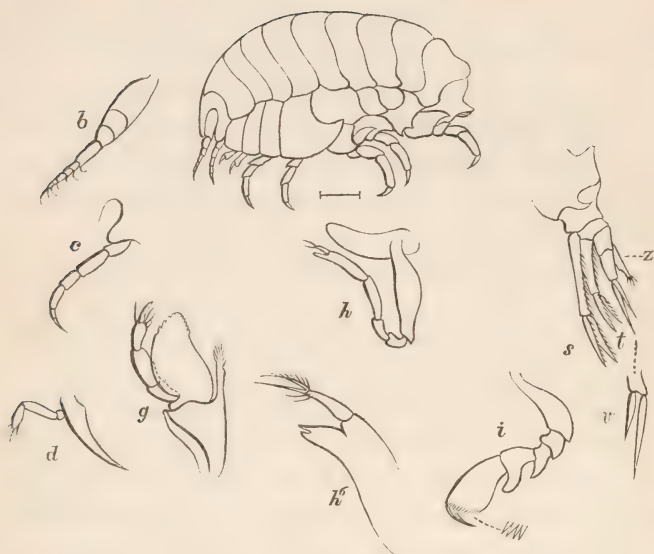
THE head is anteriorly produced. The body is much distended, while the tail is considerably narrowed. The antennæ are subequal in length, the upper being the more robust, and not furnished with a secondary appendage. The mandibles possess a three-jointed appendage. The maxillipedes terminate in a small nail. The first two pairs of legs are small, and of nearly equal size, the first terminating in a distal double-fingered claw; the second, which is rather stouter than the first, being only subchelate. The coxæ of the four anterior pairs of legs are deep, the fourth being also very broad, and posteriorly deeply excavated to receive the anterior lobe of the coxa of the fifth pair. The walking legs are short and strong, and furnished with sharp fingers. The three posterior pairs of caudal appendages are double branched, and the central tail-plate is single and scale-like.

This genus bears a near resemblance to *Iphimedia*, but is distinguished from it by the form of the maxillipedes, and by the character and proportions of the first two pairs of legs.

The near approximation of the characters of the two genera suggested the name of the son of *Iphimedia* as being appropriate for the present more recently discovered form.

AMPHIPODA.
NATATORIA.

PHOXIDES.



OTUS CARINATUS.

Specific character. Pereion furnished with a dorsal carina. Third segment of the pleon having an elevation near the dorsal centre, and the posterior margin produced into a sharp tooth near the centre on each side.

Length $\frac{4}{5}$ inch.

Otus carinatus. SPENCE BATE, Cat. Crust. Amph. Brit. Mus. p. 126, pl. xxiii. fig. 2.

THE head is very short, but produced anteriorly to a sharp point, slightly depressed. The back is furnished with a small but distinct median carina. The third segment of the tail is abruptly elevated near the middle, and again gradually depressed to the posterior margin. On each side the posterior margin is posteriorly produced, near the centre, into a long slightly-upturned tooth. The eyes have not been observed. The superior antennæ are short, being scarcely more than twice the length of the upper margin of the head; the peduncle

is more robust than the flagellum, and about the same length. The inferior antennæ are not longer than the superior, but not so stout, and terminate in a flagellum scarcely longer than the last joint of the peduncle. The mandibles are deep and narrow, and the maxillipedes are short, and furnished with a broad plate, reaching nearly as far as the finger. The first pair of legs have the hands with the lower distal angle produced into a sharp process, nearly equalling the finger in length; the finger is slender, and tipped with a distinct nail, at the base of which arise two or three hairs. The second pair of legs are a little larger than the first, and have the hand somewhat triangular in form, the palm being straight, but slightly oblique and distinctly pectinated; the finger is sharp and curved. The coxæ of the first four pairs of legs are deep, increasing gradually to the fourth, which is much broader than the others, and deeply excavated on the posterior margin towards its upper limits, in order to receive the anterior lobe of the coxa of the next succeeding pair of legs. All the walking legs are short and stout; the thighs of the three posterior are broad, and posteriorly developed into two angles. The last pair of caudal appendages have the branches unequal in length; they are sharp, straight, and clean. The terminal plate is lanceolate.

The animal was first taken by that veteran dredger, the late Mr. Barlee, off the Shetland Islands, two or three years since. During the summer of 1861 it has again been taken by the Rev. A. M. Norman and Mr. J. Gwynn Jeffreys, in from seventy to eighty fathoms, about sixty miles east of the Shetland Islands.

AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—PEREIONOTUS. N. G.

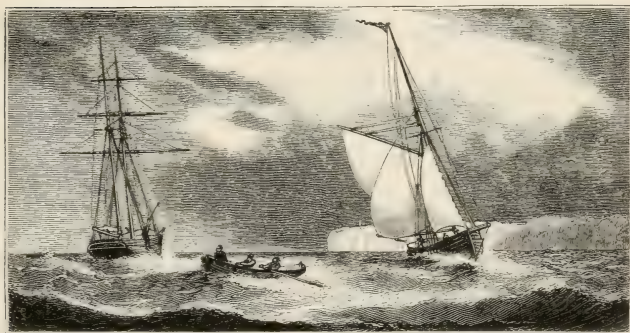
Generic character. Cephalon short. Pereion distended. Pleon compressed. Antennæ very short. Superior longer and more robust. Gnathopoda subchelate, subequal. Pereiopoda short, robust. Antepenultimate pair of pleopoda having the peduncle very short, rami long, subfoliaceous. Penultimate pair having the peduncle long, rami styliform. Ultimate pair short, unibranched. Telson single.

THE head in this genus is very short. The body is very distended, and the tail gradually narrowed to the extremity. The eyes are very small. The coxæ of the first four pairs of legs are large, whilst those of the three last are short. The hands of the first two pairs are subchelate. The walking legs are subequal, short, tolerably robust, and terminate in strong sharp fingers. The antepenultimate pair of caudal appendages have the peduncle very short, almost obsolete; and the branches are long, and look like narrow leaves. The penultimate pair have the peduncle strong, and as long as the branches, which are strong, stiff, and naked. The ultimate pair are very short, and support a single very short branch. The central terminal piece consists of a single squamiform plate.

This genus bears a near relationship to that of *Phlias* of Guérin. The only distinction of importance which we are enabled to discover exists in the form of the posterior pair of caudal appendages: these are biramous in the description and figure of *Phlias*, as given by the

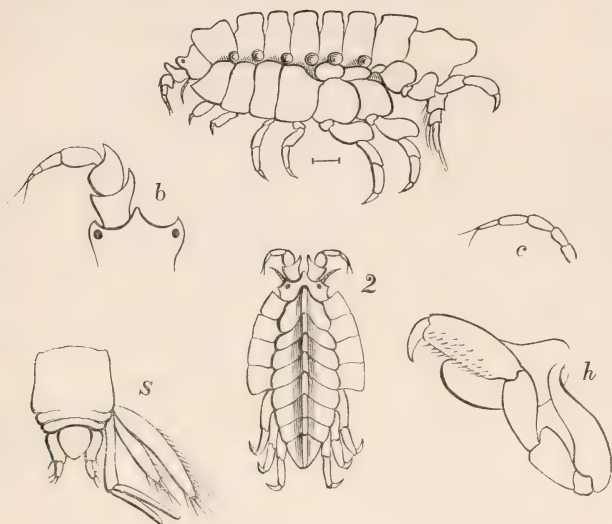
author in the "Magasin de Zoologie" for 1836. Of this latter genus we have had the opportunity of examining only a single specimen of *P. Rissoanus*, taken by Mr. J. Gwynn Jeffreys on the shores of Piedmont, but the specimen being small, we were not able to make out the form of the last pair of caudal appendages without dissection, and we felt unwilling to destroy our only specimen. We are therefore led to infer either that Guérin's description of the posterior pair of caudal appendages is incorrect, or that Montagu's specimen belongs to a distinct but closely-allied genus; and prefer to adopt a new generic name, rather than to assume, without further evidence, that so accurate an observer as M. Guérin-Mèneville can have been mistaken.

The accompanying vignette is a scene off Flamborough Head.



AMPHIPODA.
NATATORIA.

PHOXIDES.



PEREIONOTUS TESTUDO.

Specific character. All the segments of the pereion, and the first of the pleon, elevated into a strong dorsal carina, the apex being longitudinally shorter than the base, in every segment except the first of the pleon, in which the carinated process is posteriorly produced to a round point.

Length $\frac{2}{30}$ inch.

Oniscus testudo. MONTAGU, Linn. Trans. ix. p. 102, t. v. fig. 5. LEACH, Edin. Encyc. vii. p. 405, gen. lxvi. (not of Gosse and White).

THE head is short and anteriorly depressed, possessing but a very minute central point between the antennæ. All the segments of the body are dorsally elevated into a carina, flat at the top. The first segment of the tail is likewise similarly elevated, but is projected posteriorly, the carina terminating in a round process; each of the segments of the body is also marked by a small tubercle at the infero-anterior angle. The su-

perior antennæ are short, being a little longer than the head; the first two joints of the peduncle are very stout; the rest are slender. The inferior antennæ are not more than half the length of the superior, and very slender. The coxæ of the four anterior pairs of legs are very large, the first being projected anteriorly as far forwards as the eyes. The first two pairs of legs are subequal and alike in form; the hands are scarcely broader than the rest of the leg, rather more than as long again as broad, and furnished with small hairs on the inferior surface, but without any clearly-defined palm; the fingers are thick, short, slightly curved, and terminating in an obtuse point. The walking legs are of uniform length; they are short and strong, and terminate in short stout fingers; in the three posterior the thighs and metacarpal joints are considerably dilated. The antepenultimate pair of caudal appendages have the peduncle so short, that we could not detect it in our examination; while the branches resemble long narrow leaves, of unequal length and breadth, having the margins slightly fringed with cilia. The penultimate pair have the peduncle long and stiff, while the branches are unequal in length, styliform in shape, and not longer than the peduncle. The ultimate pair are very short, scarcely reaching beyond the middle tail-piece, and terminating in a single branch, not more than half the length of the peduncle. The tail-piece is almost disc-shaped.

This species was imperfectly described and figured many years since, by Col. Montagu, in the "Transactions of the Linnæan Society," from a specimen taken by him at Salcombe, on the coast of South Devon. Montagu made his drawing from the specimen when the tail was closely rolled beneath the body, as we have also done in fig. 2. He consequently represented an ani-

mal which rather resembled an *Isopod* than one of this order of Crustacea. The animal has therefore, for many years, been passed over, and Mr. Spence Bate, who was not aware of its preservation in the British Museum until recently, has omitted it from his "Museum Catalogue of Amphipod Crustacea," having followed the erroneous assumption of Mr. Gosse and Mr. Adam White, that *Oniscus testudo* of Montagu was a species of Owen's genus *Acanthonotus*.

The accompanying vignette of figures, in the picturesque costume of Normandy, is from a picture in the possession of Mr. Hames, of Chagford.



AMPHIPODA.
NATATORIA.

PHOXIDES.

Genus—ACANTHONOTUS.

Acanthonotus. OWEN, App. to Ross's Second Voyage N. W. Passage, p. xc.
WHITE, Hist. Brit. Crust. p. 177. GOSSE, Man.
Mar. Zool. p. 142. MILNE-EDWARDS, Hist. Crust.
t. iii. p. 24. SPENCE BATE, Cat. Crust. Amph.
Brit. Mus. p. 126.

Vertumnus, Leach MSS. WHITE, Cat. of Crust. Brit. Mus. 1847.

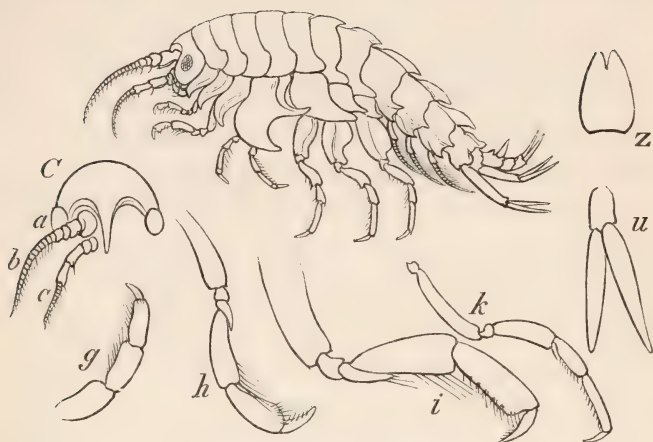
Generic character. Cephalon produced anteriorly. Antennæ simple, subequal. Mandibles with a tri-articulate appendage. Coxæ narrow, deep, and pointed, except the two last, those of the fourth legs lunate, with a strong tooth. Gnathopoda slender, feeble, subchelate. Pereiopoda subequal. Dactyla unguiculate. Posterior pair of pleopoda biramous. Telson single, cleft at the apex.

THE front of the head is considerably produced into a point, curved downwards. The segments of the body are short, whilst those of the tail are long. The antennæ are nearly of the same length (about one-fourth of the length of the animal); the superior do not possess a secondary appendage. The arms are uniform, subequal, slender, feeble, and subchelate. The coxæ of the first four pairs of legs are deep, narrow, and pointed, those of the fourth pair are sickle-shaped, having, moreover, a strong central tooth on the posterior margin. The walking legs are subequal, and have the fingers terminating in a sharp nail. The last pair of caudal appendages consist of two styliform branches, and the terminal plate is single, but cleft at the apex.

This genus was founded by Professor Owen, for a species of *Amphipod* brought from the Arctic Regions by Sir John Clark Ross.

AMPHIPODA.
NATATORIA.

PHOXIDES.



ACANTHONOTUS OWENII.

Specific character. Posterior segments of the pereion, and anterior ones of the pleon, dorsally elevated into carinal teeth. Antennæ scarcely one-fourth the length of the animal. Gnathopoda slender. Telson deeply cleft. Length $\frac{1}{2}$ inch.

Acanthonotus (?) Owenii.

SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. vol. xix. p. 141.

Acanthonotus testudo.

WHITE, Cat. Brit. Crust. p. 51 (1850). Pop. Hist. Brit. Crust. p. 177. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 127, pl. xxiii. fig. 3. GOSSE, Man. Mar. Zool. p. 42 (1855) (not *Oniscus testudo*, Mont. see ante, p. 228.)

Vertumnus Cranchii, Leach MSS.

WHITE, List Crust. Brit. Mus. p. 89, 1847.

Acanthonotus Cranchii.

WHITE, Cat. Crust. Brit. Mus. p. 57, 1847.

THE head is anteriorly produced to a point, deflexed between the antennæ. The last segments of the body, and the four anterior of the tail, are elevated into a carina; the middle of the posterior margin of each segment is produced into a strong tooth; the three anterior seg-

ments of the tail likewise possess a lateral ridge, and the posterior margins are denticulated; the fourth segment of the tail is marked by a deep sinus across the dorsal surface. The eyes are round and prominent. The superior antennæ are stouter at the base than the inferior, and are also a little longer. The coxæ are deep, narrow, and terminate in a point, those of the fourth pair of legs being the largest, sickle-shaped, and armed with a strong curved spine on the hind margin. The first two pairs of legs are very similar; the wrists are a little longer than the hands; the hands have no clearly-defined palm; and the fingers are very short. The rest of the legs are very nearly of the same length; the thighs of the three posterior gradually increase in width: they have the anterior portion thick, whilst the posterior is suddenly reduced to a thin scale, so that the legs, when folded up, lie compactly together in a groove. The three posterior pairs of caudal appendages are subequal, the branches being of uniform length, styliform, and free from hairs. The tail-piece is deeply cleft.*

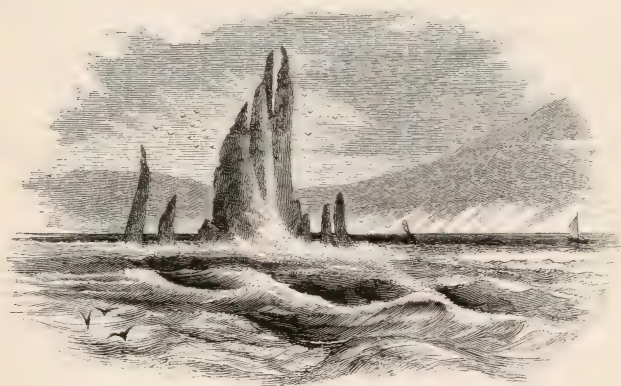
This animal, according to specimens received from the Rev. A. M. Norman and Mr. Jeffreys, is of a fawn colour striped with red, the red bands corresponding with the posterior margins of the segments and joints of the animal. In this it appears to differ from an American form, *A. serratus*, Fabricius, as described by Stimpson, where the anterior half of each segment is pink, and the posterior white.

* The figure representing this animal was drawn from a specimen in the British Museum, while the description is taken from a specimen captured in the Moray Frith. They disagree in some unimportant points; the telson being less cleft in the figure than in the description, and the hands are more distinctly subchelate in the former than the latter.

In some specimens of the young animals, when just enabled to quit the parent, we have observed that the superior antennæ are furnished with a secondary appendage, formed of a single articulus.

This species is rather plentifully distributed; we have received specimens from the Moray Frith, sent us by Mr. Edward and Mr. Gregor. The late Dr. G. Johnston took it in Berwick Bay. Professor Kinahan has taken it in from fifteen to thirty fathoms, on the Scollop Bank, in Dublin Bay. Mr. Webster has dredged it at Falmouth; and Mr. Jeffreys and the Rev. A. M. Norman have found it in from seventy to eighty fathoms, sixty miles east of the Shetland Islands.

The following vignette represents the Droghs, from a sketch by Dr. Scott, of Melby, staff-surgeon, R.N.



AMPHIPODA.
NATATORIA.

GAMMARIDES.

Subfamily—GAMMARIDES.

Body compressed. Eyes two, situated on a lobe between the superior and inferior antennæ. Inferior antennæ not situated posteriorly to the superior. Posterior pair of pleopoda foliaceous.

THE animals constituting this subfamily are generally much compressed laterally. They have two eyes, which are situated on a lobe of the walls of the head, which project anteriorly between the superior and inferior antennæ. The antennæ are planted one above the other, and are generally long, slender, and terminate in a filamentary flagellum. The first two pairs of arms are subchelate, and generally well developed. The posterior pair of caudal appendages are generally leaf-like, and fringed with cilia or hairs, but never stout spines or hooks. The terminal tail-piece is generally squamiform, except in one or two genera, where it appears to be tubular or cylindrical, resembling a rudimentary segment.

This subfamily must be considered as containing the normal types of the order, the others being greater or less departures from this perfect form. They are invariably aquatic animals, existing in fresh as well as sea water; and are most numerous distributed on our shores.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—DEXAMINE.

Dexamine.

LEACH, Edin. Encyc. vii. p. 433. SPENCE BATE, Cat. Amph. Brit. Mus. p. 130.

Acanthonotus (pars). MILNE-EDWARDS, Hist. des Crust. iii. p. 25.

Generic character. Superior antennæ having the third joint of the peduncle reduced in size, so as to resemble the first articulus of the flagellum; without a secondary appendage. Mandibles having no appendage. Gnathopoda feeble, subchelate. Telson single, divided.

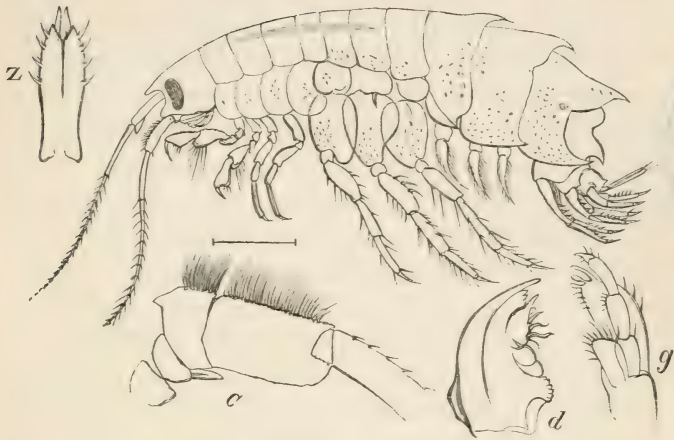
IN this genus the antennæ are of moderate length, slender, and nearly of corresponding proportions; both pairs are remarkable for the absence of a joint in the peduncle; but this absence is probably more apparent than real, arising from the last joint in each being reduced to the form and appearance of the articuli of the flagellum. The mandibles are not furnished with an appendage, a peculiarity especially characteristic of the ORCHESTIDÆ. The first two pairs of legs are subchelate, although slender. The coxæ of the four anterior pairs of legs are subequally deep and rounded; those of the three posterior are scarcely more than half as deep as the preceding. The posterior pair of caudal appendages are two-branched, and the central terminal plate is single, but constantly divided to a considerable extent down the middle.

This genus was founded by Dr. Leach, to receive a species described by Montagu under the name of *Cancer* (*Gammarus*) *spinosus*, but it was not accepted by Prof. Milne-Edwards, who referred Montagu's species to the genus *Acanthonotus*.

AMPHIPODA.

GAMMARIDES.

NATATORIA.



DEXAMINE SPINOSA.

Specific character. Each of the four anterior segments of the pleon elevated into a large posteriorly-directed tooth; first joint of the peduncle of the upper antennæ with a blunt tooth.

Length $\frac{1}{2}$ inch.

Cancer (Gammarus) spinosus.

MONTAGU, Linn. Trans. vol. xi. t. ii. fig. 1.

Dexamine spinosa.

LEACH, Edin. Encyc. vii. p. 433. Zool. Misc.

ii. p. 23. Linn. Trans. xi. p. 359. Enc.

Brit. Suppl. i. 425. SAMOUELLE, Ent.

Comp. p. 102. THOMPSON, Nat. Hist.

Ireland, iv. p. 395. DESMAREST, Consid.

sur les Crust. p. 263, pl. xlv. fig. 6.

WHITE, Cat. Brit. Crust. (1849), p. 49.

Hist. Brit. Crust. p. 178, pl. x. fig. 7.

SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58.

Ann. Nat. Hist. 2 ser. xix. p. 141, 1857.

Cat. Amph. Brit. Mus. p. 130, pl. 24, fig. 1.

Amphithoë Marionis.

MILNE-EDWARDS, Ann. des Sci. Nat. xx.

p. 375. Hist. des Crust. t. iii. p. 40. Cuv.

Règne Anim. Edit. Crochard, pl. 60, fig. 6.

Acanthonotus? spinosus.

MILNE-EDWARDS, Hist. des Crust. iii. p. 25.

Amphithoë spinosa.

GOSSE, Mar. Zool. p. 141, f. 266.

THE head has the anterior margin produced in the centre into a little flat rostrum. The body of the ani-

mal is smooth. The tail has the four anterior segments with the dorsal margin in each posteriorly produced and elevated into a strong tooth; the fourth is also marked by a dorsal sinus. The eyes are oblong. The antennæ are subequal, slender, the superior having the two joints of the peduncle of nearly the same length, the first joint being furnished, at the infero-distal extremity, with a blunt tooth. The inferior antennæ are a little shorter than the superior, and have the penultimate joint of the peduncle pubescent upon the upper surface. The first two pairs of legs are slender, and not very strong; the hands having the palms oblique, and minutely pectinated, the anterior being the more coarsely marked. The next two pairs of legs are very slender and feeble, but the last three are somewhat more robust, and generally carry the fingers directed backwards. The caudal appendages reach nearly to the same length, and have their branches equal. In Montagu's type specimen in the British Museum the middle pair of appendages are rather shorter than the others. The terminal plate is very long, and split to about two-thirds of its length; the margins are fringed with a few hairs, and the apex armed with a single spine on each side of the central division.

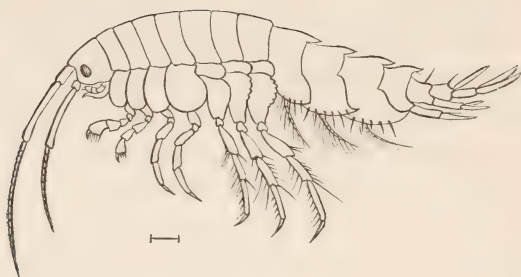
This very pretty species, which for a long time appeared to find no generic resting-place, was first figured and described by Montagu, but his description was so short, and his figure so imperfect, that Prof. Milne-Edwards was unable to identify it with the species that he described and figured under the name of *Amphitoë Marionis*. Like Montagu, Milne-Edwards figured his species from a specimen which had been deprived of the central tail-piece, which articulates so delicately in this species, that it is very commonly absent even in recently-dredged animals. Montagu's specimen is preserved in

the British Museum, while *Amp. Marionis* is in the Museum of the Jardin des Plantes. We have carefully examined both specimens, and have not a doubt but that they belong to one species. Montagu took his specimen at Tor Cross, on the Devonshire coast, whilst Milne-Edwards obtained his from the shores of Brittany; and we have received it also from the coast of Normandy, from our old and esteemed friend Mr. J. Gwynn Jeffreys. To give a list of the habitats of this species is to catalogue the localities searched by all our valued correspondents. Suffice it to say that we have obtained it from almost every place, from the Shetlands in the north, to the English Channel in the south; and Mr. Jeffreys has also sent it to us from the coast of Italy; so that, at the depth of a few fathoms of water, it appears to be very generally distributed along the coast line of Western Europe.

It is a prettily-coloured species, being brilliant red, speckled with darker spots of the same colour, when first taken from the sea. Specimens taken nearer the shore are generally of a darker and less bright tint, obtaining a stain of blue, which deprives them of that beauty which specimens from the deeper water exhibit. We have observed this variation of colour in other species under similar change of conditions.

AMPHIPODA.
NATATORIA

GAMMARIDÆ.



DEXAMINE TENUICORNIS.

Specific character. First joint of the peduncle of the superior antennæ without a tooth at its extremity.

Length 4 lines, Rathke ; Brit. Spec. $\frac{1}{10}$ inch.

Dexamine tenuicornis. RATHKE, Beitr. zur Fauna Norwegens, Nov. Act xx. p. 77, pl. xliv. fig. 3, 1843. LILJEBORG in Ofvers. af Kongl. Vet. Akad. Forhandl. p. 22, 1851.

THE head of this animal, according to Rathke, is not produced to a rostrum. The eyes are oblong. The superior antennæ have the first joint of the peduncle short and tolerably stout, but the second is two or three times longer than the first ; and the flagellum is very long and slender. The inferior antennæ have the penultimate joint of the peduncle very short, and the ultimate quite as long as that of the superior pair. The last pair of walking legs have the posterior margin of the thighs slightly crenulated, and the fingers of all the legs are proportionally much longer than in *D. spinosa*, to which species, in all other respects, this animal closely approximates. Like Montagu and Milne-Edwards, Rathke drew his figure from an animal (taken at Drontheim, on the coast of Norway) which had lost the middle tail-piece ;

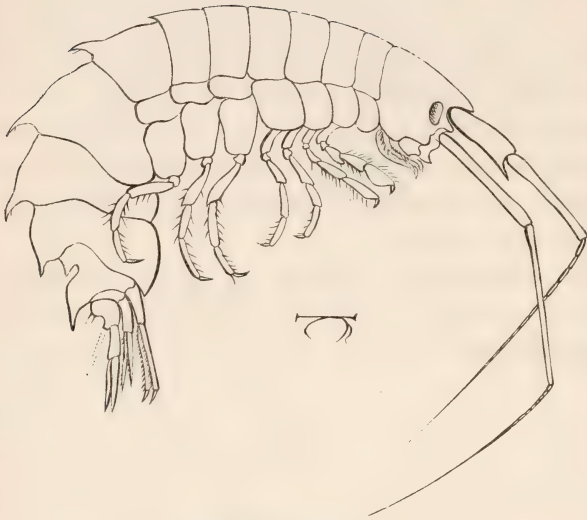
he therefore described it as wanting. We were only acquainted with this species from the description and figure of Rathke, until it was recently sent to us by the Rev. A. M. Norman, who, in company with Mr. Jeffreys, took it between the tide-marks at Lerwick, in the Shetlands. We are, however, much inclined to consider it as only a variety of Montagu's species, and it will be for future observation to determine whether the absence of a small denticle, and other peculiarities noticed above, are of specific importance.

The accompanying vignette represents a cutter and steamer: the former probably with some naturalist on a dredging expedition.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



DEXAMINE VEDLOMENSIS. N. S.

Specific character. Last segment of the pereion, as well as the first four of the pleon, dorsally carinated, and posteriorly elevated into a large tooth. Peduncle of the inferior antennæ with the last two joints very long, and of equal length.

Length $\frac{1}{4}$ inch.

THIS species has the head produced anteriorly between the antennæ into a small process; a similar but still smaller process projects upon the lateral margin, just in front of the eye, between the upper and lower antennæ. The anterior segments of the body are smooth, but the sixth exhibits a rudimentary central dorsal tooth, which is increased to a considerable extent in the seventh segment, at once distinguishing the present species from its congeners. As in *D. spinosa*, the four anterior segments of the tail are dorsally carinated, and posteriorly elevated into a tooth. The fourth segment is, moreover, distin-

guished by a very deep dorsal sinus, the anterior wall of which projects backwards, in the form of a small tooth. The eyes are oval. The superior antennæ have the first joint of the peduncle nearly as long as the head, and armed at the infero-distal extremity with an acute tooth; the second joint is more slender than the first, and about half as long again: the flagellum is long and slender. The inferior antennæ have the penultimate joint of the peduncle reaching as far as the middle of the second joint of the peduncle of the superior; the ultimate joint is as long as the preceding, and therefore reaches considerably beyond the extremity of the peduncle of the superior; the flagellum is slender, and reaches further than that of the superior pair. In other respects this species differs little from *D. spinosa*.

This species was taken by the Rev. A. M. Norman, (in whose collection the only specimen is preserved,) in the Vedlom Voe in the Shetlands.

AMPHIPODA.
NATATORIA

GAMMARIDES.

Genus—ATYLUS.

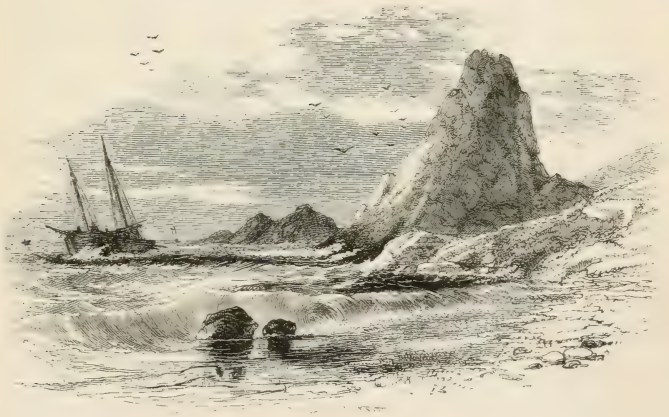
- Atylus*. LEACH, Zool. Miscel. ii. pl. lxix. MILNE EDWARDS, Hist. des Crust. t. iii. p. 67. SPENCE BATE, Cat. Amph. Brit. Mus. p. 133.
Iphimedia. DANA, U. S. Explor. Exped. p. 926.
Nototropis. COSTA, Rend. della Reale Accad. delle Sci. di Napoli, p. 170, 1853, tav. 1, fig. 7 and 8.

Generic character. Like *Dexamine*, but having the mandibles furnished with a palpiform appendage. Peduncle of the upper antennæ with the third joint distinct.

THIS genus bears a very close affinity to that of *Dexamine*. The only important difference exists in *Atylus* having the mandibles furnished with a three-jointed appendage, which is wanting in *Dexamine*. We have observed that in this genus there is very frequently some remarkable and interesting peculiarity in the development of the flagella of the antennæ. In *Atylus carinatus* of the Arctic Seas, the species on which Leach founded the genus, the flagella assume a baccated or bead-like character, each articulus being broader than long. In *A. Huxleyanus* of the Antarctic regions every third articulus is inferiorly dilated, and furnished with a fasciculus of auditory cilia; and in *A. villosus*, also Antarctic, every articulus of the flagellum belonging to the superior antennæ is inferiorly produced at the distal extremity, and covered with short downy hair; the flagellum of the inferior antennæ having the upper surface similarly furnished. Thus the two antennæ appear to be capable of being used as grasping organs by the upper and lower pairs being brought into contact with each other.

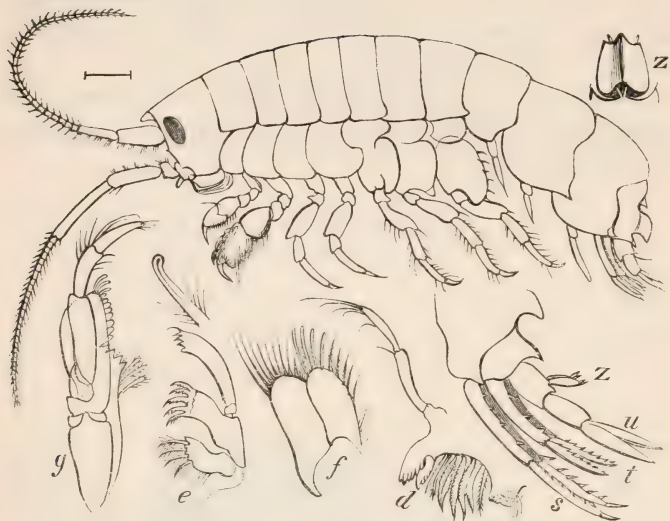
We have also observed in this genus, that although in the mature animal the superior antennæ are simple, in the young those organs are furnished with an uni-articulate secondary appendage.

The cut below was drawn for us by Miss Dansy, of Stoke, and represents Kinance Cove, a scene near the Lizard Point.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



ATYLUS SWAMMERDAMII.

Specific character. Pereion and pleon smooth. Fourth segment of the pleon having a deep central dorsal sinus, and posteriorly elevated into a strong dorsal tooth.

Length $\frac{1}{4}$ inch.

Amphitoë Swammerdamii. MILNE EDWARDS, Ann. des Sci. Nat. xx. p. 378.
Hist. des Crust. t. iii. p. 35.

Atylus Swammerdamii. SPENCE BATE, Cat. Amph. Brit. Mus. p. 136,
pl. xxvi. f. 2.

Dexamine Gordoniana. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 142,
Feb. 1857.

Dexamine Loughrini. SPENCE BATE, Cat. Amph. Brit. Mus. p. 132,
pl. xxiv. fig. 3.

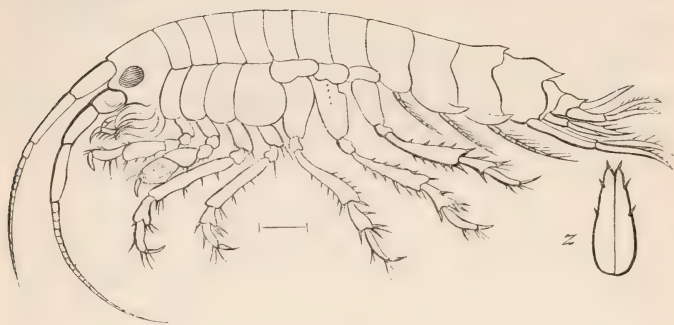
THE head of the animal is anteriorly produced into a small rostrum. The body is smooth and even, except the fourth segment of the tail, which has a deep central dorsal sinus, the anterior wall of which is produced into a sharp tooth, and the posterior portion of the segment has the dorsal medial line carinated and elevated into a strong tooth. The eyes are oval. The

antennæ are subequal, and about half the length of the animal; the peduncle of the superior pair is scarcely more than half the length of that of the inferior; the flagella of both pairs of antennæ have the articuli nearly as broad as long, each articulus in the superior pair being furnished with a single hair, and one short auditory cilium. The first pair of legs are smaller than the second, but neither of them are very strong. The legs are rather short, and the three posterior pairs have the fingers generally directed backwards. The caudal appendages are nearly of the same length, the penultimate being a little the shortest; in the last both branches are of the same length, styliform in shape, and free from hairs. The central tail-plate is about as broad as long, somewhat truncate, and cleft from the apex nearly to the base.

This species is evidently the same as that described by Prof. Milne Edwards, from the coast of Morbihan. Specimens have been sent to us from the Moray Frith, by the Rev. G. Gordon, in compliment to whom the species was named, previously to our ascertaining it to be identical with *A. Swammerdamii* of Milne Edwards. We have also taken it in Plymouth Sound. The specimen named *Dexamine Loughrini* in the "British Museum Catalogue," after Mr. Loughrin (in consideration of the services which he, a coast-guardsmen of Polperro, had done for science in collecting marine animals), was taken in the rock-pools at the mouth of that harbour, where the shore suddenly dips into many fathoms of water. Upon reconsideration, we look upon it, however, to be but a variety of this species, differing chiefly in the length of the second joint of the peduncle of the superior pair of antennæ, the length of the central caudal plate, and the general colour of the animal.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



ATYLUS GIBBOSUS.

Specific character. Fourth segment of the pleon dorsally produced into a blunt hump-like tooth. Pereiopoda, having the mera long and the carpi short and dilated at the extremity, spinose.

Length $\frac{4}{10}$ inch.

Atylus gibbosus. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 137, pl. xxvi. fig. 3.

THE fourth segment of the tail is elevated into an obtusely-pointed tooth, which, in the specimen originally described, in its contracted or rolled position, resembled a hump. In other specimens, particularly when the animal is extended, it assumes more the character of a sharp tooth. The eyes are nearly round. The antennæ are nearly of the same length, and quite half that of the animal; the second joint of the superior antennæ is a little longer than the first; the peduncle of the inferior antennæ reaches beyond that of the superior. The first two pairs of legs are feeble, the hands are small, the second being rather the larger. The five succeeding pairs of legs (the true walking feet) exhibit a striking feature: the metacarpal joints are long, and gradually increase in diameter towards the distal extremity; all the carpal joints or wrists are exceedingly short, and

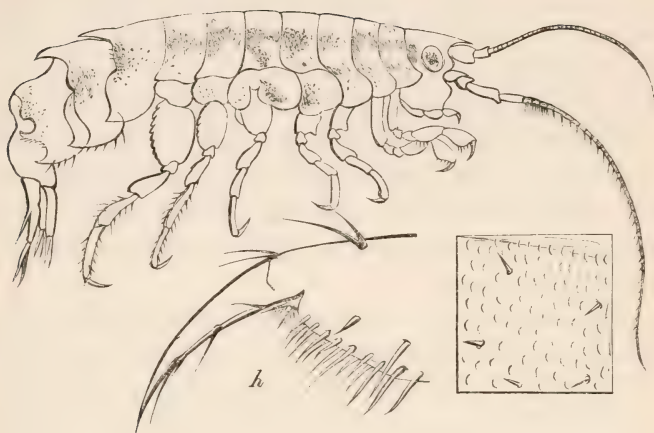
increase considerably towards the distal extremity, mostly on the posterior margin of the legs, where they are furnished with three or four strong spines, which appear to be of sufficient length and strength to assist the fingers in their prehensile acts; the hands are not longer than the wrists, and those of the posterior pair are slightly bent or waved, the fingers being directed posteriorly. The penultimate pair of caudal appendages are much shorter than the other two. The terminal caudal plate is long, tapering, and divided from the apex nearly to the base.

This species was first procured by the late Mr. Geo. Barlee, from the Shetlands; and it has since been taken by the Rev. A. M. Norman and Mr. Jeffreys, in the Outer Skerries Harbour, as well as in from seventy to ninety fathoms of water, sixty miles east of the Shetlands. Mr. Alder has also taken it on the coast of Northumberland.



AMPHIPODA.
NATATORIA.

GAMMARIDÆS.



ATYLUS BISPINOSUS.

Specific character. First and second segments of the pleon posteriorly produced into two strong dorsal teeth. Latero-posterior margin of the third segment ornately waved and serrated.

Length $\frac{1}{4}$ inch.

Dexamine bispinosus. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 142, 1857.
WHITE, Pop. Hist. Brit. Crust. p. 173.

Atylus bispinosus. SPENCE BATE, Cat. Amph. p. 140, pl. xxvii. fig. 1.

THE head is anteriorly produced, between the superior pair of antennæ, into a small rostrum. The first two segments of the tail have the postero-dorsal margins produced into two strong teeth; the third segment of the tail has the posterior margin considerably waved on each side: commencing from the middle of the back, it is first concave, then produced on each side into a small lobe; it is again deeply sinuated, the lower edge of the sinus produced in the form of a strong recurved tooth, below which it is indented, the margin being closely serrated to the inferior angle, which terminates in a sharp tooth.

The eyes are of a broad oval form, being white round the margins and black in the centre. The antennæ are long and slender: the superior pair are about half the length of the animal, but the peduncle is scarcely longer than the head: the inferior pair are about one-third longer than the superior; the peduncle is also longer than that of the superior. The first and second pairs of legs are of the same size and form, the hands being dilated scarcely beyond the diameter of the legs; the palms of the hands are oblique, and fringed with numerous hairs of unequal lengths; the fingers are furnished, on the inner margin near the apex, with a small tooth, larger in proportion than that represented in the figure at *h*, and one or two small hairs. The other legs exhibit nothing worthy of remark. The caudal appendages are all double-branched, the branches being of uniform length and styliform, those of the last pair extend considerably beyond the other two. The central caudal plate is ovate, with a slit down the middle; it generally lies closely pressed against the animal.

The surface of the skin, when examined with the microscope, is seen to be covered with numerous half-round small scale-like processes or plates, and a few short hairs, as represented in our figure.

When first taken, the colour of the animal is of a greenish grey, mottled with black and yellow spots, particularly in the line corresponding with the alimentary canal, and also upon the dorsal surface of the tail.

We have dredged this species on the sandy bottom in Whitsand Bay, not far from the Rame Head; and have received it from the Moray Frith, through the kindness of the Rev. G. Gordon and Mr. Gregor; also from Falmouth and Tenby, where it was dredged by Mr. Webster: and Mr. Alder has found it on the coast of Northumberland.

AMPHIPODA.

NATATORIA.

GAMMARIDES.

Genus—PHERUSA.

- Pherusa*. LEACH, Edin. Encyc. vii. p. 432. Trans. Linn. Soc. xi. p. 360. Enc. Brit. Suppl. p. 426. DESMAREST, Consid. sur. Crust. p. 269, pl. xlv. SPENCE BATE, Cat. Amph. Brit. Mus. p. 143. (Not of KOCH, Deutschlands Crustaceen, &c. Heft. xxix. pl. 24, which is an Isopod.)
- Amphitoë*. MILNE EDWARDS, Ann. des Sci. Nat. t. xx. p. 376. Hist. des Crust. iii. p. 32.
- Amphithoë*. DANA, United States' Explor. Exped. p. 910 (part).

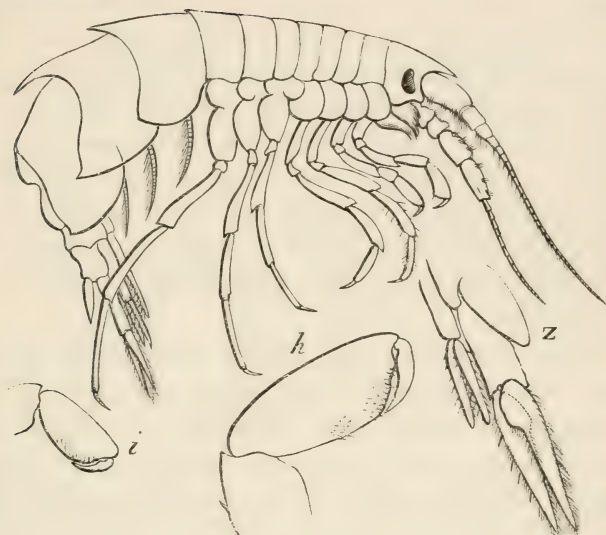
Generic character. Like *Atylus*, but telson not divided. Gnathopoda small.

THIS genus is very near to *Atylus*; in fact, the demarcation through some of the exotic species is so feeble, that some carcinologists may doubt the propriety of our separating them. *Atylus Huxleyanus*, from Hermit Island (Antarctic Ocean) indeed might be allotted to either genus, since the cleft in the terminal caudal plate is reduced to a mere indentation of the apex. But since, in this and other nearly-allied genera, there are many species which can be grouped into separate divisions, we think that it will be found convenient to consider them as forming separate genera.

In addition to the entire central caudal plate, which is the chief distinction between this genus and *Atylus*, the difference in the form and size of the gnathopoda separates it from *Calliope*.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



PHERUSA BICUSPIS.

Specific character. First two segments of the pleon dorsally produced into teeth, and the posterior margin of the third segment not serrated ; fourth segment deeply sinuated.

Length $\frac{5}{20}$ inch.

Amphithoë bicuspis. KROYER, Grön. Amph. p. 45, pl. i. fig. 1.

Pherusa bicuspis. MILNE EDWARDS, Hist. des Crust. t. iii. p. 38. SPENCE BATE, Cat. Amph. Brit. Mus. p. 144, pl. xxvii. fig. 7.

Pherusa cirrus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 143, pl. xxvii. fig. 6.

THE head is anteriorly produced between the superior antennæ. The first two segments of the tail have the dorsal surface posteriorly produced into sharp cusps or flat teeth ; the third segment has the postero-lateral margin smooth—a circumstance which offers a ready point of distinction between this species and *Atylus bispinosus*. The eyes assume a little of the kidney-

shape. The antennæ are nearly of the same length, being about half as long as the animal: the inferior pair are the shorter of the two, but their peduncle is longer than that of the superior pair. The arms resemble each other, and are nearly of the same size, the second pair being slightly smaller than the last pair. The last pair of caudal appendages reach considerably beyond those of the two preceding pairs; the terminal branches are of the same length, and have the margins ciliated. The caudal central plate is long and narrow.

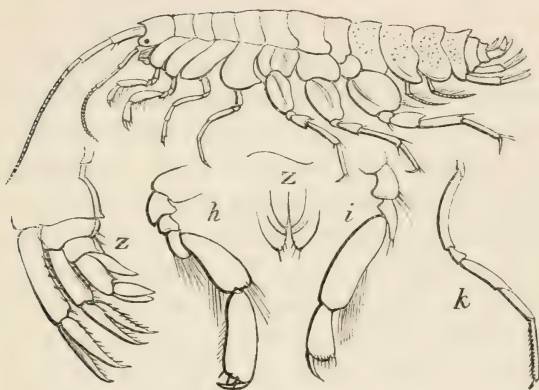
In the Catalogue of the British Museum Mr. Spence Bate has described a species under the name of *Ph. cirrus*, which differs from *Ph. bicuspis* in having the antennæ shorter, and remarkable in having the upper margin of the peduncle of the inferior antennæ furnished with several tufts of short hairs, placed at tolerably regular distances apart; but upon reconsideration, we believe that *Ph. cirrus* can only be regarded as a variety of the present species, which was established by Kroyer upon a specimen taken on the coast of Greenland.

We have had specimens sent to us by Mr. Edward, from Banff; by Mr. Webster, from Tenby and Falmouth; and in the collection of the late Mr. Thompson, of Belfast, which has been kindly entrusted to Mr. Westwood for this work, are several specimens which were dredged in Belfast Bay, Sligo, and Bangor (co. Down), in from six to ten fathoms of water.

In examination under the microscope, we could perceive nothing remarkable in the structure of the integument of this animal.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



PHERUSA FUCICOLA.

Specific character. Pereion smooth. Pleon having a slight dorsal carina ; the fourth segment being produced posteriorly to a small tooth. Posterior pair of pleopoda having the rami equal, but not longer than the peduncle.

Length $\frac{7}{10}$ inch.

- Pherusa fucicola.* LEACH, Edin. Encyc. vii. Append. to Art. Crustaceology, p. 432. Enc. Brit. Suppl. 1, p. 426, pl. xxi. Trans. Linn. Soc. xi. p. 360. SAMOUELLE, Ent. Comp. p. 104. DESMAREST, Consid. Crustaces, p. 269, pl. xlv. fig. 10. SPENCE BATE, Cat. Amph. Brit. Mus. p. 145, pl. xxvii. fig. 9. THOMPSON, Ann. Nat. Hist. xx. p. 242, Oct. 1847.
- Amphitoë fucicola.* MILNE EDWARDS, Ann. des Sc. Nat. t. xx. p. 377. Hist. des Crust. t. iii. p. 32. THOMPSON, Nat. Hist. Ireland, iv. p. 396, and Ann. Nat. Hist. xx. p. 242. WHITE, Cat. Brit. Crust. p. 50.
- Amphitoë Jurinii.* MILNE EDWARDS, Ann. des Sc. Nat. t. xx. p. 376. Hist. des Crust. t. iii. p. 30, pl. i. fig. 2. BELL, in Append. Belcher's Last of the Arctic Voyages, p. 406.
- Amphitoë microura.* COSTA, Rend. della Reale Accad. delle Scienze di Napoli, 1853, p. 175, tav. 3, fig. 2.
- Dexamine fucicola.* SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 142, Feb. 1857. WHITE, Hist. Brit. Crust. p. 179.

THE head is anteriorly produced into a small central point, which generally lies hidden between the upper

antennæ. The body of the animal is smooth, but the dorsal surface of the tail is marked by a very slight carina, which terminates in a small tooth at the posterior margin of the fourth segment. The eyes of the animal are very small in the type specimen. The superior antennæ scarcely reach to the half of the length of the animal. The inferior antennæ in the typical specimen are about two-thirds the length of the superior, whereas the peduncle is quite as long as, but thinner than, the peduncle of the superior. The first two pairs of legs are equal in size, but the hand of the second pair is shorter than that of the first, and the palm a little more convex. The legs are very uniform in length; the thighs of the last three being somewhat dilated. The last pair of caudal appendages have the branches of an equal length, but not longer than the peduncle, and in the typical specimen they do not reach beyond the extremity of the preceding pair.

The figure given in the preceding page was drawn from the typical specimen of Dr. Leach in the British Museum, and differs from that given in the "Catalogue of Amphipoda of the British Museum" in a few details, the most important of which are the length of the last pair of caudal appendages, and the length of the inferior antennæ. The latter distinction is not important, since it depends upon the length of the flagellum only, which is very liable to vary, whereas the peduncle is quite as long and important as the peduncle of the superior. The former difference may perhaps be of greater importance, but it requires much consideration before we can separate into distinct species animals upon so slight a variation, particularly as we have observed specimens in which the length of these branches were intermediate between the types of Leach and Ed-

wards. If they be the same species as we suppose, they are, when alive, of an amber or straw-colour, marked with faint rose-coloured bands.

The type of the species is in the British Museum, and was obtained by Colonel Montagu, from rocky shores in Devonshire, under stones, and at low tide under fuci. The specimens which we consider of the same species have been sent to us from Falmouth and Tenby, where they were dredged by Mr. Webster. At Polperro they have been taken by Mr. Loughrin; Mr. Edward has sent them to us from Banff; and Thompson recorded the species in the "Annals of Natural History," for October, 1847, as taken at Youghal, on the coast of Ireland, by Mr. R. Ball. A specimen, under the name of *Amphithoë microura*, which appears to us to belong to this species, was taken by Sig. A. Costa on the coast of Naples; and one described by Professor Milne Edwards, under the name of *Amphithoë Jurinii*, was found at the island of Chausay, on the Atlantic coast of France. It is also recorded by Professor Bell as being among the Crustacea brought home by Sir Edward Belcher from the Arctic Seas.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—CALLIOPE.

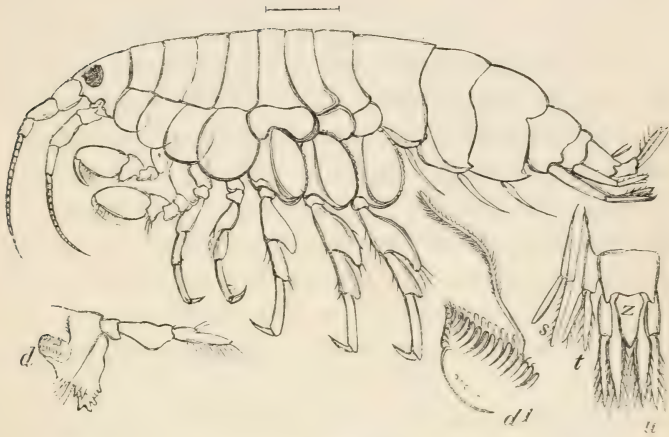
Calliope. LEACH, MS. Coll. Brit. Mus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 148. WHITE, Hist. Brit. Crust. p. 179.

Generic character. Like *Pherusa*, except that at least the second pair of gnathopoda have the propodos largely developed.

THIS genus, like the preceding, partakes, in a strong degree, of the more or less arbitrary character of the majority of generic divisions, differing from *Pherusa* in nothing but the relative proportions of one or both of the first two pairs of legs. Although to a certain extent the separation is not natural, we consider that it will be found convenient to adopt Leach's views in distinguishing the large-handed species from those in which the hands are uniformly very slender and feeble. *Paramphithoe* of Bruzelius (*Acanthosoma*, Owen) and *Amphithonotus* of Costa, have no stronger claims to generic distinction than *Atylus*, *Pherusa*, and *Calliope*, and by sinking them, we should link together in one genus some widely different forms, and so fall into a similar error with Costa and Stimpson, the former of whom united *Dexamine spinosa* (Amphitoë Marionis, Milne Edwards), *Pleustes panopla* (Amphitoë panopla, Kroyer), and *Atylus carinatus* (Gammarus carinatus, Fabricius), and the latter also added *Paramphithoë hystrix* (*Acanthosoma hystrix*, Owen) in one genus under the name of *Amphithonotus*.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



CALLIOPE LÆVIUSCULA.

Specific character. Eyes tolerably large. Superior antennæ having the third joint of the peduncle infero-distally produced to a short tooth. Gnathopoda having the propoda large, oval, and robust.

Length $\frac{1}{2}$ inch.

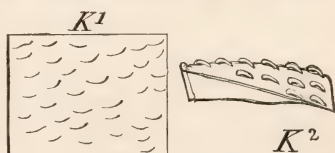
Amphithoë læviuscula. KROYER, Grönl. Amph. p. 53, t. 3, fig. 13. MILNE EDWARDS, Hist. des Crust. t. 3, p. 30. BELL, Append. Belcher's last Arctic Voy. p. 405.

Calliope Leachii. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xix. p. 142 (Feb. 1857). [Cat. *C. Leachii* Amph. Brit. Mus. p. 148, pl. xxviii. fig. 2.] WHITE, Pop. Hist. Brit. Crust. p. 179.

THE head is produced anteriorly to a small point between the superior antennæ. The first three segments of the tail have the posterior margin a little elevated in some specimens. The fourth segment has a broad but not deep depression, which appears to receive the posterior margin of the third segment when the animal is extended. The eyes are black, and tolerably large and irregularly round. The antennæ are nearly of the same

length; the superior pair have the infero-distal extremity of the peduncle furnished with an obtuse tooth, and all the articuli of the flagellum are inferiorly and anteriorly enlarged, and support a short auditory cilium, as well as a hair or two; the inferior pair are scarcely as long as the superior. The arms are nearly of the same size, having the hands tolerably large, and forming, with their respective wrists, a tolerably perfect oval; the palms are oblique, but not defined; the fingers impinge closely against the palms throughout their entire length when shut. The walking feet are all of a uniform length, and the fingers are slightly curved and strong. The terminal caudal plate is subacutely lanceolate.

Under the microscope the integument of the animal is seen to be covered by minute scale-like elevated processes, as shown in the annexed cut.

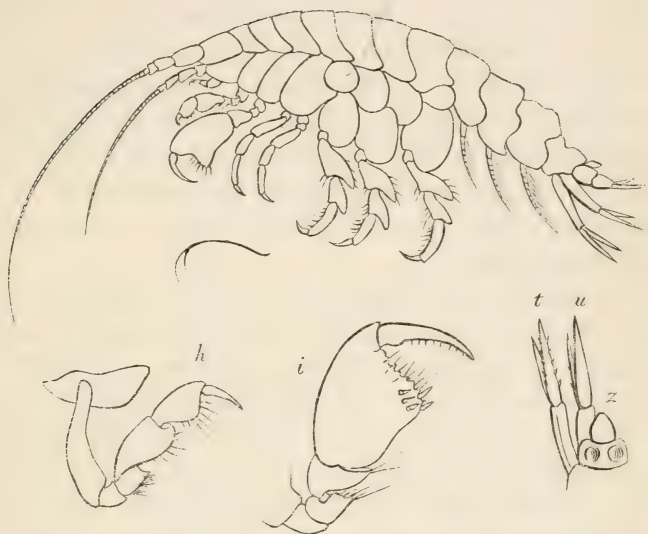


The type of this species, which was found on the Devonshire coast, has long been in the British Museum, where it has been preserved under the MS. name of *Calliope*, given to it by Dr. Leach, without any specific name. But Kroyer, in his work on the Amphipoda of Greenland, has described and figured it under the specific name which we have adopted.

We have received specimens from the Moray Frith, through the kindness of Mr. Edward and the Rev. Geo. Gordon, as well as from Tenby, where it was dredged by Mr. Webster.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



CALLIOPE OSSIANI.

Specific description. Propodos of the second pair of gnathopoda much larger than the first. Palm straight, not oblique, furnished with a few short spines near the inferior angle; three posterior legs with the middle joints very broad and acutely angulated.

Length $\frac{1}{2}$ inch.

Calliope Ossiani. SPENCE BATE, Cat. Amph. Brit. Mus. p. 149, pl. xxviii. fig. 3.

THE head is produced anteriorly to a very minute point; the three anterior segments of the tail are dorsally elevated posteriorly, and very slightly carinated. The eyes are white,—a circumstance that was kindly pointed out to us by the Rev. A. M. Norman, who states it to be so constant a feature that by it he could at once distinguish this species. The superior antennæ are longer than the inferior. The first pair of legs are small; the

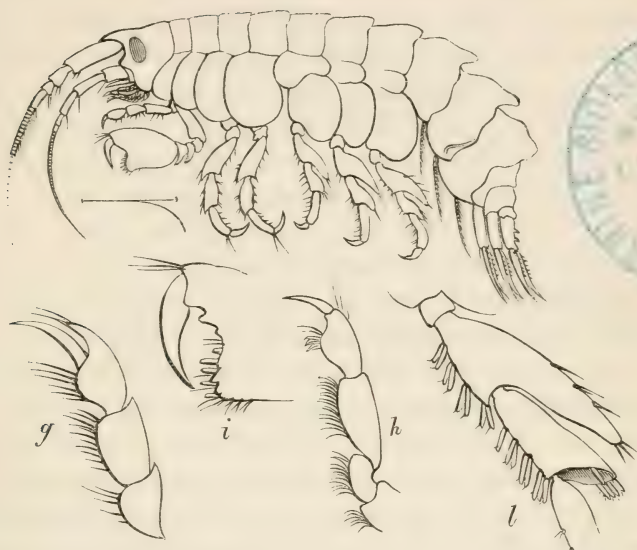
second pair are large, having the hand broad, truncate; the palm being at nearly right angles with the inferior margin, and furnished near the inferior angle with several strong short hair-like spines. The finger is arched. The walking legs are all nearly of the same length, the three posterior pairs being very broad. The last two pairs of caudal appendages have the branches unequal in length, the last pair not reaching beyond the extremity of the preceding. The terminal caudal plate is short and ovately lanceolate.

We received this species first from Mr. Edward, of Banff, from which specimen the original description in the Catalogue of the British Museum was drawn up. In the description, as well as in the figure accompanying it, the antennæ are represented of the same length; but a considerable number of specimens sent to us by the Rev. A. M. Norman, from the coast of Yorkshire, have the antennæ invariably unequal in length. We have, therefore, considered the specimen from Banff as having been damaged or an accidentally altered form, and regard the Yorkshire specimens as typical of the species. We have also received it from the Shetlands from Mr. Norman. The late Dr. G. Johnson also sent us a number of specimens from Berwick Bay. The colours of the specimens from the Shetlands were of a dark orange, striped with brownish red; each band corresponding with the posterior margin of each segment of the animal.

This and the following species are named in honour of the two great northern heroes whose history has come down to us so dimly through the vista of time.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



CALLIOPE FINGALLI. N.S.

Specific character. Like *C. Ossiani*, but having the last segment of the pereion, and first three of the pleon, with the posterior dorsal margins produced into an obtuse tooth, each increasing in size posteriorly.

Length $\frac{1}{2}$ inch.

THIS species may possibly be only an exaggerated variety of *C. Ossiani*. All the features peculiar to that species appear, however, in this, to be so much developed (as noticed in our descriptions), that they altogether change the appearance of the animal.

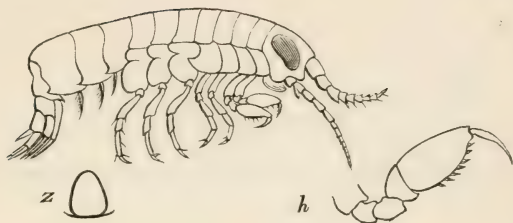
The cephalon is produced anteriorly into a short flat rostrum. The back of the animal is round from the first to the seventh segment of the body, which is produced posteriorly and slightly elevated into a tooth. This feature is repeated in the first three segments of the tail, increasing in dimensions posteriorly. The teeth are

rather obtuse, and the last is so broad at the base that it assumes more the appearance of a hump than a tooth. The eyes are large, reniform, and of a red-orange colour. The superior pair of antennæ are more robust than the inferior, and we presume that they are longer, but the flagellum is mutilated in our unique specimen. The articuli of the flagellum are very short, and except the first all are shorter than broad, each supporting on the inferior surface a few hairs and an auditory cilium. The inferior antennæ are about one-fourth of the length of the animal, and have the olfactory process extremely long. The maxillipeds have the sixth joint anteriorly produced nearly as long as the finger, which is very long and slender. The first pair of legs have the hand small, and but slightly dilated; they are ovate, with the palm oblique. The second pair have the hand large, increasing in width to the palm; the inferior margin being straight, while the superior is arcuate, especially towards the wrist. The palm is concave, not oblique, defined by two or three small cusps on the inferior angle, and furnished with several stout blunt spines. All the walking legs are short, stout, nearly of the same length, and furnished upon the inner margin with short blunt spines, subapically tipped with a single cilium. The caudal appendages reach nearly to an equal extent, and the branches are furnished, on the posterior margins, with short spinules.

The animal, after being placed in spirits, is straw-coloured, except the eyes and the posterior segment of the tail, which are tinted with a blush of red. We have only seen one specimen, which was taken by Mr. J. Gwynn Jeffreys, during the last summer, off the Shetland Islands.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



CALLIOPE GRANDOCULIS.

Specific character. Eyes one-third of the size of the cephalon. Antennæ robust. First and second pairs of gnathopoda nearly equal in size.

Length $\frac{3}{20}$ inch.

Calliope grandoculis. SPENCE BATE, Cat. Amph. Brit. Mus. p. 149, pl. 28, fig. 4.

THE eyes are very large, being of a long oval form, and reaching nearly to the posterior margin of the head, of which they occupy nearly a third. The superior antennæ have the peduncle scarcely longer than the head, the third joint being infero-distally produced. The flagellum is short, and every articulus is infero-distally enlarged. The inferior antennæ are much more slender than the superior. The hands of the first two pairs of legs are alike, being of an oval form; the palms are oblique and not defined. The walking legs are rather slender, and nearly of one length. The posterior pair of caudal appendages are tolerably free from hairs, and the central caudal plate terminates in an obtuse point.

This species was received by us from the Rev. Geo. Gordon, who obtained it from the Moray Frith.

Another large-eyed specimen, differing in some slight respects from the present species, was taken by Mr. Edward at Banff.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—EUSIRUS.

Eusirus. KROYER, Tidsk. (2), p. 801. SPENCE BATE, Cat. Amph. Brit. Mus. p. 154.

Generic character. Like *Atylus*, except that the superior antennæ are furnished with a secondary appendage. The gnathopoda have the carpi considerably produced inferiorly, and attached to the upper margin of the propoda. Propoda large and equal.

THIS genus in its general aspect nearly agrees with *Atylus*, but is separated from it by some important features. The head is not anteriorly produced into a rostrum. The superior pair of antennæ are furnished with a secondary appendage. The hands of the first two pairs of legs are large and of the same form, the wrists articulating with the superior rather than with the posterior margin, and being considerably produced inferiorly corresponding with the posterior margin of the hands. The legs generally are slender, and about the same length. The posterior caudal appendages are double-branched, and the middle tail-scale is cleft at the apex.

This genus was founded by Kroyer to receive a species dredged by Holboll on the coast of Greenland.

An imperfect specimen is as yet the only British representative of this genus.

AMPHIPODA.

GAMMARIDES.

NATATORIA.



EUSIRUS HELVETIÆ.

Specific character. Inferior process of the carpi of both pairs of gnathopoda not produced as far as the inferior angle of the palm.

Length (?)

Eusirus Helveticæ. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 185, pl. xxix. fig. 1.

THE head is short. The superior antennæ have the first joint of the peduncle longer than the second. The flagellum is about twice the length of the peduncle; the articuli being broader than long, each being furnished with cilia upon the infero-distal point. The secondary appendage (which is very small in the genus) is not appreciable in this species. The inferior antennæ are scarcely shorter than the superior, but the peduncle is rather longer than that of the superior. The arms have the inferior process of the wrists, not reaching quite to the inferior angle of the hands, which are somewhat lozenge-shaped, the palms being oblique, slightly convex, and fringed with a row of solitary cilia.

We only know this species through an imperfect specimen taken by Mr. Edward in the Moray Frith. It is the first and only British representative of the genus which we have seen.

The difference in form between the British and Arctic species is chiefly conspicuous in the shortness of the

inferior angle of the wrists of the former when compared with the latter. But we think that it is not improbable that *E. Helvetiæ* may be only the young of *E. cuspidatus*, from the fact that in the young animals of *E. cuspidatus*, figured by Mr. Spence Bate in the British Museum Catalogue, the inferior process of the wrists is represented by rudimentary lobes only; these, as they grow in size, would probably represent every degree of extension between the two extremes. On the other hand the chief circumstance that induces us to consider this as a mature animal, distinct as a species from *E. cuspidatus*, is the form of the flagella of the antennæ, since in the young of *E. cuspidatus* each articulus is longer than those in the adult.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—LEUCOTHOE.

- Leucothoe*. LEACH, Edin. Ency. vii. p. 403. Trans. Linn. Soc. xi. p. 358. Suppl. Ent. Brit. i. p. 425. SAMOUELLE, Ent. Comp. p. 103. EDWARDS, Hist. des Crust. t. iii. p. 56. Ann. des Sc. Nat. t. xx. p. 380. DESMAREST, Consid. Crust. p. 263. WHITE, Hist. Brit. Crust. p. 188. Cat. Crust. Brit. Mus. 1847. Cat. Brit. Crust. Brit. Mus. 1850. SPENCE BATE, Cat. Amph. Brit. Mus. p. 156. Ann. Nat. Hist. 2 ser. vol. xix. p. 146, 1857 (not of Kroyer or Dana).
- Lycesta*. SAVIGNY, Mem. sur les Animaux sans Vert. vol. i. p. 109. Egypt. Crust. pl. ii. f. 2.

Generic character. Antennæ simple, nearly equal. Mandibles, with a very minute palpiform appendage. Gnathopoda having the carpi inferiorly produced to at least half the length of the propoda. Propodos in the first pair slender, in second broad. Middle pair of pleopoda shortest. Telson simple.

IN this genus the body of the animal is long and compressed. The antennæ are simple, and nearly of the same length. The footjaws are subpediform, and unguiculate—that is, they have not the large squamiform plates attached to some of the joints which are present in many other genera, but have a stronger resemblance to the condition of simple legs, and terminate with a sharp point at the extremity of the finger. The mandibles are furnished with an appendage. The first pair of legs have the wrists produced along the inferior margin of the hand as far as its distal extremity, the terminal half being free; in the second pair the wrist is produced along the inferior margin of the hand to half its length; but in the first pair the hand is narrow, whereas it is

very broad in the second. The walking feet are all about the same length. The posterior pair of caudal appendages are double branched, and the central tail-piece is single and squamiform.

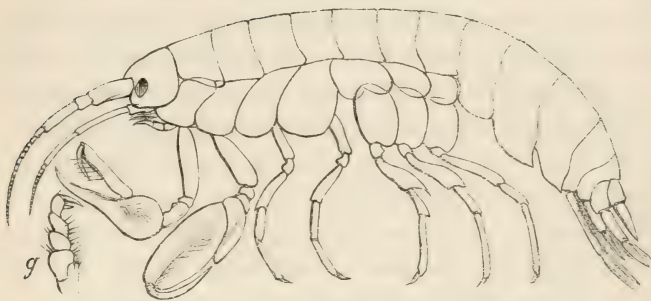
This genus was established by Leach to receive a species discovered by Montagu. But Kroyer and Dana in following him, have certainly mistaken the description of Leach, since the two species which the former has described and figured do not belong to this genus at all, but to that of *Montagua*.

The following vignette represents one of the Plymouth fishing-boats denominated locally "Hookers." It is from a small picture by Condry.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



LEUCOTHOE ARTICULOSA.

Specific character. First pair of gnathopoda with the carpus pyriform ; second pair having the propodos ovate, the palm smooth.

Length $\frac{3}{4}$ inch.

Cancer (Gammarus) articulatus. MONTAGU, Linn. Trans. vii. p. 70, pl. vi. f. 6.

Leucothoe articulosa.

LEACH, Edin. Encyc. vii. p. 403. Linn. Trans. xi. p. 358. Suppl. Enc. Brit. i. p. 425. SAMOUELLE, Ent. Comp. p. 103. DESMAREST, Consid. sur Crust. p. 263, pl. 45, f. 5. MILNE EDWARDS, Hist. des Crust. t. iii. p. 58, pl. 29, f. 14. LILJEBORG, Ofvers. af kongl. Vet. Akad. Forhaudl. 1855, p. 126. WHITE, Pop. Hist. Brit. Crust. p. 188. Cat. Crust. Brit. Mus. 1847. Cat. Brit. Crust. 1850, p. 53. GOSSE, Man. Mar. Zool. p. 141, fig. 259. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 146. Cat. Amph. Brit. Mus. p. 156, pl. xxix. f. 2. MULLER, Zool. Dan. iii. p. 66, pl. cxix. f. 1-4.

Gammarus spinicarpus.

THE head is anteriorly produced into a small rostrum curved downwards between the superior antennæ. The eyes are obliquely planted in the head, of an oval shape and a red colour. The superior antennæ are about one-

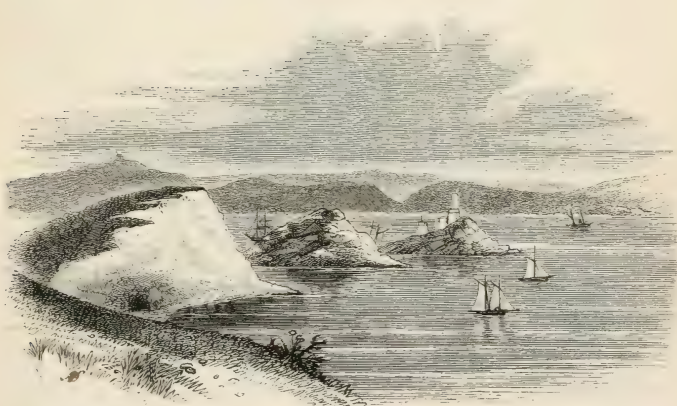
fourth the length of the animal, having the flagellum not more than half as long as the peduncle. The inferior antennæ are not quite so long as, and more slender than, the superior, and also have a short flagellum. The first pair of legs are tolerably long; the wrist is stouter than the hand, and has the infero-distal margin produced to a sharp free point, reaching quite to the extremity of the hand, where it performs the part of a thumb, thus with the finger it makes a tolerably perfect but complex grasping organ, the hand itself being narrow and the finger short. The second pair of legs are about the same length as the first, but the wrist is not so broad as the hand, and does not reach beyond half its length; the hand is of an oval form and much broader than that of the first pair, it is convex upon the outer and concave upon the inner surface, and when folded up forms a strong shield defending the first pair of legs and the anterior organs of the body; the palm is slightly convex, even, and continuous with the posterior half of the inferior margin, from which its limit is not defined; the finger is long and reaches as far as the inferior extremity of the wrist, with which it assists in forming a complex claw of a less perfect character than that of the first pair of legs. The walking legs are nearly of the same uniform length and size. The posterior pair of caudal appendages have the branches of the same length, they are somewhat leaf-like in form, reaching further than the extremity of the penultimate, but not further than that of the antepenultimate pair. The central tail-piece is long, lanceolate, and convex upon the upper surface.

The animal, when alive, possesses a delicate pink or flesh-coloured tinge. It was first taken by Montagu, many years since, on the coast of Devon. We have received it from the Moray Frith through the kindness of

the Rev. Geo. Gordon, but we have not found it among the numerous Crustacea forwarded to us from the Shetlands. Liljeborg announces it as having been taken by him at Kullaberg, on the south coast of Sweden. Mr. Loughrin has sent it us from Polperro in Cornwall; and we have taken it in Plymouth Sound as well as on the south coast of Wales.

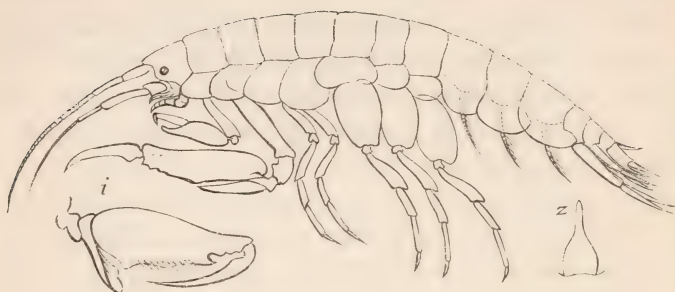
Beneath is a view of the Mumbles, at the southern extremity of Swansea Bay, as seen from the hill behind.

From this point to Oxwich Bay was our chief dredging ground, and is generally referred to when we record the coast of Wales as the habitat of a species.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



LEUCOTHOE FURINA.

Specific character. Second pair of gnathopoda having the propodos with the palm notched or serrated near the distal extremity.

Length $\frac{3}{4}$ inch.

Lycesta furina. SAVIGNY, Mem. sur les Anim. sans Vert. i. p. 109, pl. iv. f. 2. Egypte Crust. pl. ii. f. 2.

Leucothoe furina. MILNE EDWARDS, Ann. des sc. nat. t. xx. p. 381. Hist. des Crust. iii. p. 57. GUÉRIN-MENEVILLE, Icon. Crust. pl. xxvi. f. 6 (after Savigny). WHITE, Pop. Hist. Brit. Crust. p. 189. SPENCE BATE, Ann. Nat. Hist. ser. 2, vol. xx. p. 255. Cat. Amph. Brit. Mus. p. 157, pl. xxix. f. 3.

Leucothoe procera. SPENCE BATE, Ann. Nat. Hist. 2 ser. vol. xix. p. 146.

THIS animal closely resembles the preceding. The most conspicuous points of distinction exist in the round form of the eyes of this species; in the first pair of legs, the wrist of which has not the infero-distal extremity produced quite so long; and in the second pair the hand is not so oval, but tapers more to the extremity, and has the palm defined and marked by a few indentations rather than teeth. The terminal caudal plate narrows suddenly for some distance before it approaches the apex.

This species was first taken by Savigny when in Egypt with the French army. In this country a specimen, taken by Mr. Edward of Banff, was described by Mr. Spence Bate in the Synopsis of the British Edriophthal-

mous Crustacea (Ann. Nat. Hist. for February 1857), under the name of *L. procera*, but which we are not able to distinguish from the figure in Savigny's work. This species appears not to be so common as *L. articulosa*, but yet we cannot suppose that it would be found at such distant parts without existing in intermediate localities. It may probably have been mistaken by collectors for the previous species, which might readily be done without attention.

The following vignette represents the Cows' (Gulls') Castle, on the shores of the Moray Frith, kindly drawn for us by Mr. Small.



AMPHIPODA.

NATATORIA.

GAMMARIDES.

Genus—GOSSEA.

Gossea. SPENCE BATE, Cat. Amph. Brit. Mus. p. 159.

Generic character. Superior antennæ without a secondary appendage. Gnathopoda subchelate; first pair the larger. Pleopoda long, nearly of equal length; posterior pair biramous. Telson single, squamiform.

THE body of the animal in this genus is slender and compressed. The superior antennæ are not furnished with a secondary appendage, and the peduncles of both pairs are shorter than their respective flagella. The first pair of legs are furnished with hands larger than those of the second, and both pairs are subchelate. The posterior pair of caudal appendages are double-branched and reach considerably beyond the extremity of the central caudal plate which consists of a single scale.

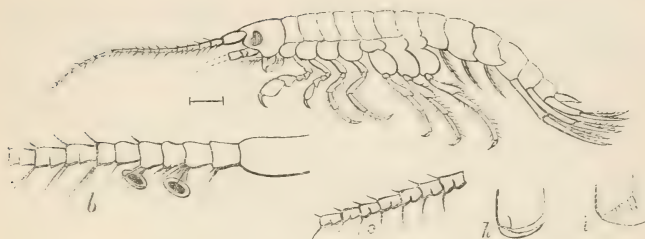
The animals of this genus bear a near resemblance to those of *Microdeutopus* in their general aspect, but differ from them in the absence of the secondary appendage to the superior antennæ, and in the form of the telson.

To the genus *Dryope* they approach nearer; but the more compressed form of the body and greater length of the caudal appendages sufficiently separate the two genera.

The genus has been named in compliment to Mr. Gosse, whose numerous contributions to Marine Zoology have greatly tended to popularize many obscure productions of nature.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



GOSSEA MICRODEUTOPA.

Specific character. Superior antennæ with each joint of the peduncle gradually decreasing in length; flagellum longer than the peduncle, and having the alternate articuli distally and inferiorly produced and furnished with a few cilia. First pair of gnathopoda having the propodos long-quadrate, with the palm slightly convex.

Length $\frac{3}{25}$ inch.

Gossea microdeutopa. SPENCE BATE, Cat. Amph. Brit. Mus. p. 160. pl. xxix. fig. 6.

THE eyes are tolerably large, rounded in form, and black. The superior antennæ are about one-third the length of the animal, having the peduncle very short and the flagellum tolerably long, the latter having the alternate articuli infero-distally produced and furnished with a few hairs of unequal length. The second and fourth articuli likewise bear short, broad, trumpet-mouthed auditory cilia. The first pair of legs have the hand long-quadrate, the palm is slightly rounded. In the second pair the hand is more slender than in the first, and the palm is shaped and defined by a small spine. The walking legs are all nearly of the same length. The caudal appendages are long and slender, the last having the peduncle extending further than the extremity of the central caudal-plate. The branches are of one length, styliform, and furnished upon their upper margins with

a few short spines. The central caudal-plate is long, narrow, and lanceolate.

The specimen from which our description and figure are taken was captured by Mr. Gosse, at Ilfracombe, and kindly sent to us. At first we took it for a young animal belonging to the genus *Microdeutopus*; but closer examination having convinced us of the distinction, we have named the animal specifically after the genus it so much resembles.

We have recently received other specimens of this species from the Shetlands, where they were taken by the Rev. Mr. Norman.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—AORA.

- Aora*. KROYER, Tidsk. ser. 2, i. p. 335, 1845. SPENCE BATE, Cat. Amph. Brit. Mus. p. 160.
Lalaria. NICOLET, in Gay's Historia de Chile, vol. iii. 1849. SPENCE BATE, Ann. Nat. Hist. xx. p. 525, 1858.
Lonchomerus. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xix. p. 143. WHITE, Hist. Brit. Crust. p. 180.

Generic character. Superior antennæ longer than the inferior; furnished with a secondary appendage. First pair of gnathopoda larger than the second, having the meros infero-distally produced as far as the extremity of the carpus. Seventh pair of legs longest.

IN this genus the animal is long and slender. The superior antennæ are very long and are furnished with a slender secondary appendage. The inferior antennæ are about half the length of the superior and furnished with a very short flagellum. The first pair of legs are very long, complexly* chelate, having the metacarpal joint infero-distally produced so as to meet the apex of the finger when closed. The second pair of legs are subchelate and much smaller and shorter than the first. The last pair of walking legs are much longer than the others. The caudal appendages are double-branched, and the terminal caudal plate is tubular.

The modifications of form, and consequently of function, which the two first pairs of legs undergo in different groups of Amphipoda are nowhere more interestingly

* We use the term "complexly chelate" where the prehensile organ is formed by more joints than the propodos and daetylos.

seen than in the present genus as compared with *Leucothoe* and *Stimpsonia*. In these genera the first pair forms a most effective organ of prehension, the prehensile power being, however, developed in different joints of the limb. In *Leucothoe* and *Stimpsonia* it is the carpus which is remarkably produced, but in *Aora* the metacarpus becomes the analogue of the carpus of the two former genera.

At first sight it might seem that this genus should be incorporated in that of *Microdeutopus*, but the fact of exotic species possessing the characters here laid down sufficiently warrants their retention as a separate genus.

We think it not improbable that further observation may induce the removal of the closely-associated genera in which the peculiar tubular kind of tail-scale is found, from the position in which we have placed them among the *Gammarides*, to one nearer the genus *Nænia* among the *Podocerides*. The difference in the relative strength of the two pairs of antennæ will also afford some clue to the propriety of such a change of position.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



AORA GRACILIS.

Specific character. Basos of the first pair of gnathopoda having the anterior margin without a tooth. Finger with the internal margin serrated. Length $\frac{1}{4}$ inch.

- | | |
|------------------------------|---|
| <i>Lonchomerus gracilis.</i> | SPENCE BATE, Rep. Brit. Assoc. 1855. Ann. Nat. Hist. 2 ser. xix. p. 143. WHITE, Pop. Hist. Brit. Crust. p. 180. |
| <i>Lalaria gracilis.</i> | SPENCE BATE, Ann. Nat. Hist. 2 ser. xx. p. 525, 1858. |
| <i>Aora gracilis.</i> | SPENCE BATE, Cat. Amph. Brit. Mus. p. 160, pl. xxix. f. 7. |

THE body of the animal is long and slender. The eyes are small, round, and black. The superior antennæ are more than half the length of the animal, the flagellum forming more than half of the organ: the secondary appendage is slender. The inferior antennæ are scarcely more than half the length of the superior; and the flagellum is very short, being scarcely half the length of the last joint of the peduncle of the inferior. The first pair of hands are very long and slender, having the second joint long, and unfurnished with a tooth-like process, thus differing from *Aora typica*, the South

American species. The metacarpal joint is produced inferiorly into a long free tooth-like process, reaching as far as the extremity of the wrist, which itself is very long. The hand is not half the length of the wrist, slender and slightly tapering. The finger is about the same length as the hand, and when closed reaches the extremity of the metacarpal process, with which it forms a complex claw. The second pair of gnathopoda are not more than half the length of the first, and are simply subchelate; the hand being but slightly dilated, having the palm oblique and imperfectly defined. The next three pairs of legs are rather shorter than the second, but the sixth pair are about a third longer, and the seventh are one-fourth longer than the sixth. The last pair of caudal appendages do not reach beyond the extremity of the preceding.

The colour of the animal is of a claret-red, with numerous small dark spots, chiefly on the coxæ and dorsal surface of the tail. We have taken, from some trawl refuse, a specimen of a yellow colour, speckled with black spots of a larger size than those in the red specimens; and which also had the inner margin of the finger of the first pair of legs smooth, as shown at *h* in our figure. We have also observed a second specimen, in which the first pair of legs are shorter and more robust; but these being the only differences, we think that they must be looked upon rather as varieties from the typical form than distinct species. The distinctions may indeed be those of sex, in combination with local or other causes, for as yet the female has not been distinguished.

An animal of this species long remained unnamed in the British Museum. Our specimens were first taken in Oxwich Bay, in Glamorgan, and subsequently we ob-

tained others from trawl refuse brought from near the Eddystone. Mr. Loughrin has sent the species to us from Polperro, and Mr. Barlee took it both in Loch Fyne and off St. Ives in Cornwall; Mr. Jeffreys and the Rev. A. M. Norman have dredged it in forty fathoms one mile north of Walsey Lighthouse, as well as in from two to five fathoms in the outer Skerries Harbour in the Shetlands.

It is singular to record that the only other known species of this genus (and which, as far as we are able to determine by the figures given by Kroyer and Nicolet, are distinguished from this by the presence of a small process or tooth upon the second joint of the first pair of legs) should have so distant a habitat as the coast of Chili.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—STIMPSONIA.

Stimpsonia. SPENCE BATE, Cat. Amph. Brit. Mus. p. 162.

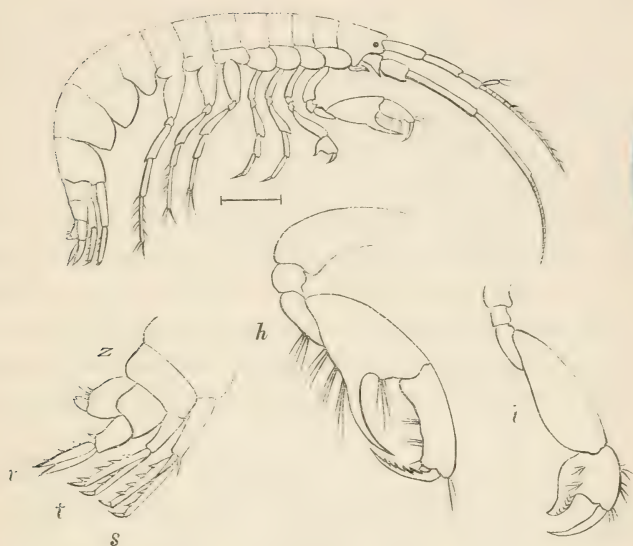
Generic character. Superior antennæ shorter than the inferior, furnished with a secondary appendage. First pair of gnathopoda robust, with the carpus large, and armed with a strong bent spine. Second pair of gnathopoda chelate.

THIS genus probably bears too close a resemblance to *Microdeutopus* to be retained as generically distinct; but the superior antennæ, instead of being longer than the inferior, are very much shorter. The first pair of legs are longer than the second, and are complexly chelate; the second pair are small and chelate, and the wrist is greatly elongated. The posterior pair of legs are longer than the preceding. The posterior pair of caudal appendages are double-branched, and the central tail-piece is conical.

The name given to this genus is in compliment to the distinguished naturalist of the United States' Exploring Expedition to the North Pacific, and to whom we wish here to record the obligation that we are under, both for information and specimens of various species described by him.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



STIMPSONIA CHELIFERA.

Specific character. Superior antennæ scarcely longer than the peduncle of the inferior. First pair of gnathopoda having the inferior margin of the carpus inferiorly produced to a long, sharp process. Second pair having the inferior angle of the propodos produced nearly as long as the finger.

Length $\frac{7}{25}$ inch.

Stimpsonia chelifera. SPENCE BATE, Cat. Amph. Brit. Mus. p. 162, pl. xxix, fig. 9.

THE animal bears a strong general resemblance to *Microdeutopus Gryllotalpa*. It has the eyes small, round, and black. The superior antennæ are scarcely longer than the peduncle of the inferior, and have the flagellum about half the length of the organ. The secondary appendage consists of a single articulus. The first pair of legs have the wrists large and inferiorly produced to a long, sharp process, reaching nearly as far as the

extremity of the hand, being separated from it by a concave space. The hand is much narrower than the wrist, and the finger is long, and but slightly curved and serrated; the apex when closed impinges against the extremity of the carpal process. The second pair of legs have the wrists very long; and the hand is scarcely more dilated, but not longer than it is broad, the inferior angle being produced to a strong thumb-like process, separated from the finger by a wide palm: the finger is slight and nearly straight, and falls against the extremity of the thumb when closed. The next two pairs of legs are slender, and the three last pairs gradually increase in length posteriorly. The rest of the animal bears a near resemblance to the species of *Microdeutopus* or *Aora*.

We received this very curious and interesting form from Salcombe Harbour on the south coast of Devonshire, where it was taken by Mr. Webster.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—MICRODEUTOPUS.*

- Microdeutopus*. COSTA, Rend. delle Reale Accad. delle Sci di Napoli, 1853, s. 171.
Microdentopus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 163.
Lembos. SPENCE BATE, Rep. Brit. Assoc. 1855. Ann. Nat. Hist. 2 ser. xix. p. 142. WHITE, Pop. Hist. Brit. Crust. p. 180.
Gammarus. Division ††. LILJEBORG, Ofvers. af Kongl. Vet. Akad. Forhandl. 1854, p. 455.

Generic character. Superior antennæ longer than the inferior, and furnished with a secondary appendage. Inferior antennæ more robust than the superior. First pair of gnathopoda larger than the second, complexly subchelate. Second pair smaller than the first, subchelate.

IN this genus the animals are generally long and slender. The eyes are small. The superior antennæ are longer than the inferior, and not so robust. The mandibles are furnished with a three-jointed appendage. The arms terminate with subchelate hands, and, as in the two preceding genera, are developed contrary to the general distinction among Amphipoda, the first being larger and more perfect than those of the second pair. The last pair of legs are much longer than the others. The last pair of caudal appendages are double-branched. The terminal tail-piece is conical, tubular, with a double apex, which appears to arise out of the largest part. The exact form of the caudal tail-piece is peculiar to this genus, although it bears a near resemblance to the same organ in *Aora* and *Stimpsonia*. It appears like a true

* Signor Costa's generic name, *Microdeutopus*, would more properly be written *Microdeuteropus*, it being given to the genus in allusion to the minute size of the *second* pair of legs.

segment to the body; and the double apex suggests the idea of the rudimentary condition of obsolete caudal appendages.

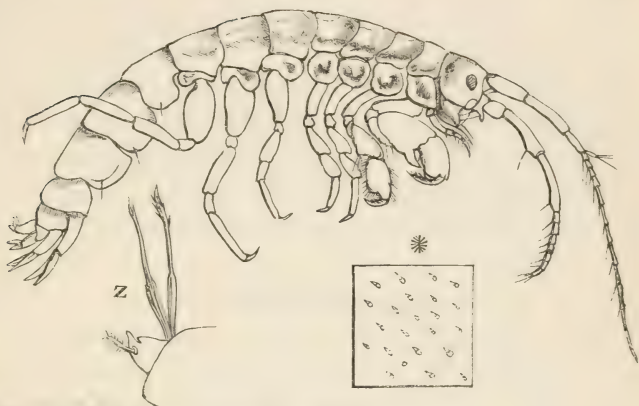
This genus is probably synonymous with *Unciola* of Say and that of *Glaucanome* of Kroyer. But the former genus is described as having no finger to the second pair of hands, and both authors omit a description of the middle tail-piece; we therefore retain Costa's name until we have the opportunity of examining typical specimens of these two genera.

The following vignette is that of a Fisherwoman of Penzance, furnished with her "Cowal" of fish.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



MICRODEUTOPUS GRYLLOTALPA.

Specific character. First pair of gnathopoda having the carpus furnished infero-distally with a sharp tooth.

Length $\frac{5}{16}$ inch.

- Microdeutopus gryllotalpa.* COSTA, Rend. della Reale Accad. delle Sci. di Napoli, 1853, p. 178. and Mem. pel. 1853, tav. 4, fig. 10. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 163, pl. xxx. f. 1.
- Lembos Dammoniensis.* SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xix. p. 142, 1857.
- Lembos Dammoniensis.* WHITE, Pop. Hist. Brit. Crust. p. 180.

THE eyes are round, small, and white, with black spots. The superior antennæ are about half the length of the animal. The flagellum is longer than the peduncle, and the secondary appendage consists of but a single articulus. The inferior antennæ reach to about half the length of the flagellum of the superior, while the flagellum is not longer than the last joint of the peduncle of the inferior. The first pair of legs have the wrist and hand associated in the formation of the claw. The wrist is large, strong, and furnished at the infero-distal extremity with a strong

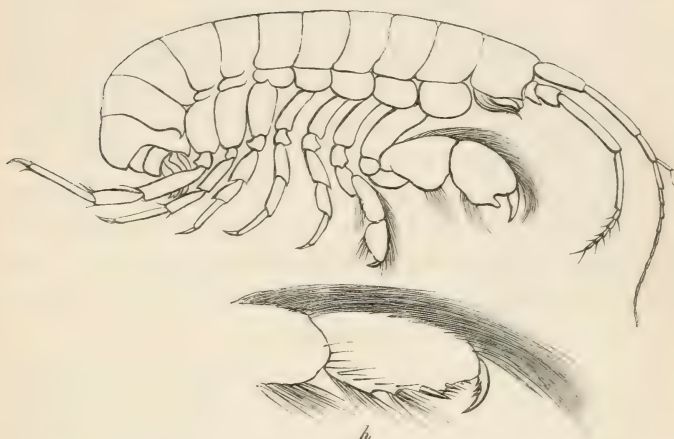
tooth-like process. The hand is large, but neither so broad or long as the wrist; the palm is rounded but not defined; and the finger is distinctly serrated upon the inner margin. The second pair of legs have the wrist and hand but slightly dilated: the palm is rounded off, imperfectly defined, and furnished with a few hairs. The finger, like that of the preceding pair, is serrated upon the inner margin. In the last three pairs of legs the thighs are less developed than ordinarily, the last pair of legs are but moderately prolonged. The three pairs of caudal appendages extend to nearly the same length, and consequently have the peduncles and their branches gradually decreasing in their relative lengths successively. The terminal tail-piece is furnished near the apex with one or two long, somewhat peculiarly formed hairs, and also one or more short plumose cilia.

Under the microscope the skin is seen to be covered by numerous minute points as in the vignette at *.

This species was first found by our friend the late Mr. Howard Stewart, Sub-Curator of the Hunterian Museum of the Royal College of Surgeons, under the Hoe, Plymouth, in a sponge. Mr. Loughrin has also sent us specimens from Polperro. It has also been dredged from seventy to ninety fathoms of water, sixty miles east of the Shetland Islands; and Costa took his animals, which we consider to be identical with our specimens, at Naples: it has therefore been necessary to sink the name of *Lembos Damnoniensis*, as first proposed, for the older name of Costa. Among the specimens which we have received were some without any tooth upon the carpus of the anterior pair of gnathopoda—these may possibly be females.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



MICRODEUTOPUS WEBSTERII.

Specific character. First pair of gnathopoda having the carpus without a tooth, and the propodos with a tooth at the inferior angle.

Length $\frac{5}{20}$ inch.

Microdentopus Websterii. SPENCE BATE, Cat. Amph. Brit. Mus. p. 164, pl. xxx. fig. 2.

Lembos Websterii. SPENCE BATE, Ann. Nat. Hist. 2 ser. vol. xix. p. 142, 1857. WHITE, Pop. Hist. Brit. Crust. p. 180.

THE superior antennæ are not quite half the length of the animal. The flagellum is about the same length as the peduncle. The first pair of legs have the wrist unarmed, and as large as the hand, and both are thickly furnished with long hairs upon both margins, but particularly the upper; the hand is rounded, and broadest behind the palm, the inferior angle of which is produced to a short stout tooth, against the apex of which the finger appears to impinge within the extremity. The second pair of legs have the wrists longer than the hand, and both margins (especially the upper) furnished with long

hairs; the palm is defined by a strong spine and a few hairs; the inner margin of the finger is serrated near the middle. In other respects this species resembles *M. gryllotalpa* both in form and colour, being of a grey which assumes a very dark tint along the dorsal surface, particularly towards the anterior extremity of the animal. This darker portion is produced by numerous small pigment cells, which spread themselves, more or less thickly, just beneath the dermal tissue. We have observed in this species (though we think it also belongs to others of the genus), that when the animals are dried the surface of their bodies exhibits prismatic hues.

We have received it from Falmouth, where it was dredged by Mr. Webster, to whom we are indebted for the results of his dredgings in several localities, and in compliment to whom the species is named. Mr. Barlee has also sent it us both from the Island of Skye, as well as from the Shetlands; and in the latter place the Rev. A. M. Norman, in company with Mr. Jeffreys, has dredged it in four fathoms of water in Bressy Sound.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



MICRODEUTOPUS ANOMALUS.

Specific character. First pair of gnathopoda large but unarmed. Last pair of legs remarkably long.

Length $\frac{1}{4}$ inch.

Gammarus anomalus.

RATHKE, Nova Acta Leop. p. 63, tab. iv. fig. 7, 1843. LILJEBORG, Ofvers. af Kongl. Vet. Akad. Forhandl. 1854, p. 457.

Microdentopus anomalus.

SPENCE BATE, Cat. Amph. Brit. Mus. p. 164, pl. xxx. fig. 3.

Lembos Cambriensis.

SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xix. p. 142, 1857. WHITE, Pop. Hist. Brit. Crust. p. 180.

THE eyes in this species are black, of a long-oval form, and planted obliquely in the head. The superior antennæ are about half the length of the animal, and furnished with a secondary appendage consisting of four minute articuli. The inferior antennæ are about one-third shorter than the superior; but the peduncle is quite as long as that of the superior. The first pair of legs have the wrist shorter than the hand but not broader. The hand is of a long-oval form; the palm is convex, and is continuous with the inferior margin, without its limits

being defined ; a few cilia stand upright from its surface, and on the inferior margin it supports four short rows of hairs. The finger is short and serrated upon the inner margin. The second pair of legs resemble the first very much in form, but they are smaller and less covered with hairs. All the other parts of the animal closely resemble the corresponding parts in *M. gryllotalpa*.

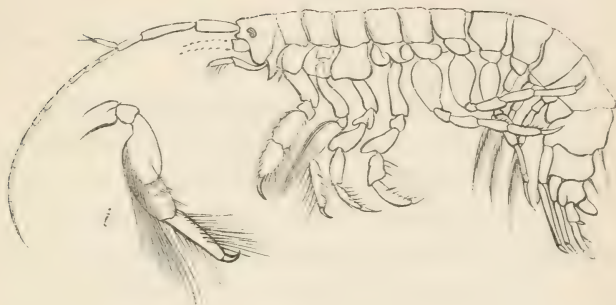
The colour in this species is of a yellowish horny appearance, sparingly scattered with black dots, which are less numerous along the dorsal surface, where there are a few bands of a faint pink colour.

This species was first taken by us in Oxwich Bay, on the coast of Glamorgan. Mr. Robertson has found it amongst Nullipore at Cumbrae, in North Britain; the Rev. A. M. Norman and Mr. Jeffreys have dredged it in from three to five fathoms in the outer Skerries harbour, Shetland, and Rathke and Liljeborg have taken it on the coast of Norway.

The animals of this species bear a very close resemblance to some which we received with *M. gryllotalpa*, and which we considered as the females of that species. It is, however, the only form which has been taken at Oxwich Bay and on the coast of Norway. Evidence of this kind, indeed, can only bear a negative value ; but so far as our present knowledge extends, this form must be accepted as distinct from the preceding, and which is one of the links gradually leading from the more complexly formed type of *M. gryllotalpa* to that of the more simple as it exists in the genus *Protomedeia*.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



♀ MICRODEUTOPUS VERSICULATUS.

Specific character. Gnathopoda not completely chelate, and furnished with a copious brush of hairs.

Length $\frac{2}{20}$ inch.

Lembos versiculatus.

SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58.

Synopsis, &c., Ann. Nat. Hist. 2 ser. xix.

p. 142. Feb. 1857. WHITE, Pop. Hist.

Brit. Crust. p. 180.

Microdentopus versiculatus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 165, pl. xx. fig. 5.

THE eyes are small. The superior antennæ are about half the length of the animal; the flagellum being a little longer than the peduncle; and the secondary appendage is uni-articulate, and furnished with two long terminal hairs. The first pair of legs have the wrist rather longer and as broad as the hand, both margins of the joints being continuous and thickly fringed with hairs; the palm is not defined, neither is the finger serrated upon the inner margin. The second pair of legs have the wrist and hand of about equal length and diameter. The wrist is furnished upon the anterior margin with a thick

brush of very long hairs. The hand is long and narrow, and fringed on both margins with a few hairs; the palm is very oblique and not defined; the finger is short and much curved.

The rest of the animal appears to bear a near resemblance to *M. gryllotalpa*.

The specimen from which our figure is taken was damaged, the inferior antennæ and last pair of walking legs being broken off. By an error one of the latter is figured as being present, but it is drawn considerably too short, most probably it is of the same dimensions as that in the other species. The specific name also, proposed in allusion to the fascicle of hairs on the second pair of legs, has accidentally been incorrectly printed, but its proposer considers that there is less liability of confusion if the original name, though established by accident, be retained, than if it were now to be altered.

The animal is of a horny colour, gradually passing into a gray tint along the dorsal surface.

It was dredged by us near Plymouth, in company with our friend Mr. H. Stewart.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—PROTOMEDEIA.

Protomedeia. KROYER, Tidskr. iv. p. 154.

Leptocheirus. ZADDACH, Syn. Crust. Prussicorum Prodomus, p. 7.

Ptilocheirus. STIMPSON, Mar. Invert. of Grand Manan, p. 55.

Generic character. Like *Microdeutopus*, but having the second pair of gnathopoda not subchelate.

THIS genus is probably too closely associated with the preceding. But the form of the second pair of legs offers a similar ground of distinction as that which separates *Talitrus* from *Orchestia*. The coxæ, moreover, appear to be rather deeper in this genus than in *Microdeutopus*; and the last pair of legs are not so proportionally long as compared with the sixth pair. The last pair of caudal appendages are double branched. We are uncertain as to the character of the central caudal plate since most of the specimens we have had an opportunity to examine have been more or less imperfect, but in *P. Whitei* it appeared to be double, whilst Zaddach defines it as being sub-membranous and rounded above.

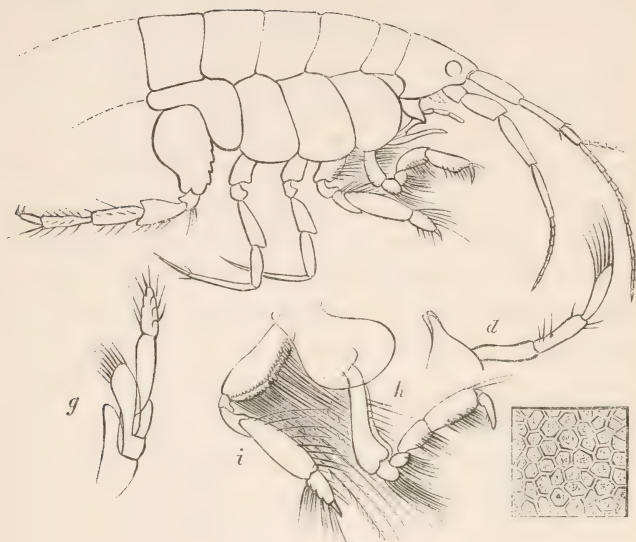
The animals of this genus, though not abundant, appear to be widely distributed in the colder regions; specimens being taken on the northern coast of the United States of America, on the coast of Scotland, in the Baltic, and off the shores of the Crimea.



AMPHIPODA.

NATATORIA.

GAMMARIDES.



PROTOMEDEIA HIRSUTIMANA.

Specific character. First pair of gnathopoda hirsute on the posterior margin of ischium, meros, carpus, and propodos. Second pair of gnathopoda hirsute upon the posterior margin of the propodos; and having the anterior margin of the basos furnished with two or three longitudinal rows of very long plumose hairs.

Length—?

Protomeдея hirsutimana. SPENCE BATE, Cat. Amph. Crust. p, 168, pl. xxx. f. 6.

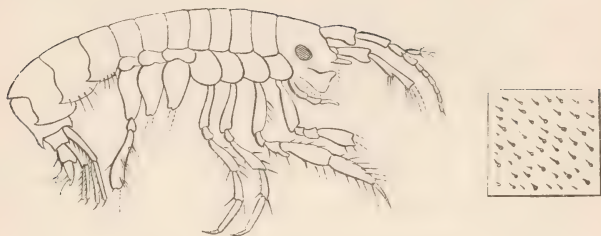
THE eyes are round but not very large. The superior antennæ extend as far as the posterior margin of the fourth segment of the body. The flagellum is scarcely as long as the peduncle, and the secondary appendage is as long again as the last joint of the peduncle. The inferior antennæ are but very little shorter than the superior; and the flagellum is very short, being not so long as the last joint of the peduncle. The mandibles

are furnished with an appendage, consisting of three equal joints. The first pair of legs have the coxæ very small, being almost covered with the coxæ of the second pair. The four last joints, except the finger, are posteriorly furnished with fasciculi of hairs. The hand is not more dilated, but is twice as long as the wrist; the palm is very short, and but imperfectly defined; the finger is longer than the palm, sharp, and but slightly curved. The second pair of legs have the coxæ large, the thigh moderately long, having the anterior margin convex, and fringed with two or three closely-set rows of long plumose hairs. The next two joints are short, but the wrist is twice as long as the hand; the hand is short and tapering to a point, at the extremity of which the finger exists as a short straight spine; the posterior margin is furnished with four bunches of hair. The next two pairs of legs are moderately long, and terminate in tolerably long straight fingers. The fifth pair of legs have the hand slightly produced at the distal extremity against which the short curved finger is capable of being shut, and so convert it into a slightly-prehensile organ.

Unfortunately we have only received the anterior moiety of an animal of this interesting species, which was taken near Banff, by our valued correspondent Mr. Edward.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



PROTOMEDEIA WHITEI.

Specific character. Gnathopoda furnished with but few short hairs. Carpus of the second pair not longer than the propodos.

Length $\frac{4}{25}$ inch.

Protomeдея Whitei. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 169, pl. xxxi. f. 3.

IN this species, the figure represents the head rather too large, probably resulting from distortion under the microscope. The first three segments of the tail have the infero-posterior angle produced to a point; and the inferior margins are furnished with a few equidistant single hairs. The fourth segment of the tail has the posterior dorsal margin produced to a small tooth. The eyes are round. The superior antennæ have the first joint of the peduncle distally enlarged, whereas the two succeeding are slender; the flagellum is not so long as the peduncle, and the secondary appendage consists of but one long and one short articulus. The second pair of antennæ are imperfect beyond the penultimate joint of the peduncle, but this reaches beyond the extremity of the peduncle of the superior. The first pair of legs are also imperfect. The second

pair of legs are only furnished with a few scattered hairs; the wrist is not longer than the hand, which gradually tapers from the carpal articulation to the extremity, where is attached a short sharp finger. The next two pairs of legs are tolerably long, but terminate in rather short fingers. The last three pairs of legs are damaged, but the thighs are dilated, and taper rather suddenly to the extremity. The last of the caudal appendages were wanting in the only specimen that we have obtained; and the terminal plate is double, differing in this respect from Zaddach's description of *P. pilosa*, as well as from those exotic species which we had the opportunity of examining through the kindness of Mr. Stimpson.

Of this species, like the preceding, we have received only a single specimen which was taken at Banff, by Mr. Edward; and which we have named in compliment to Mr. Adam White, the author of a popular History of the British Crustacea, as well as of many valuable Papers on Carcinology published in the Proceedings of the Zoological Society of London.

AMPHIPODA,
NATATORIA.

GAMMARIDES.

Genus—BATHYPOREIA.

- Bathyporeia.* LINDSTRÖM. Bidrag Osternsjons, Invert. Faun. in Ofvers. Kongl. Vet. Akad. Forhandl. 1855, p. 59. Nat. Hist. Review, Jan. 1857, p. 43. WHITE, Hist. Brit. Crust. p. 187.
- Thersites.* SPENCE BATE, Rep. Brit. Assoc. 1855. p. 59. Ann. Nat. Hist. 2 ser. xix. p. 146.

Generic character. Superior antennæ short; having the first joint of the peduncle large and tumid; the second articulating on the infero-distal extremity of the first, and furnished with a secondary appendage. Inferior antennæ slender; twice as long as the superior; mandibles with a tri-articulate appendage. First pair of gnathopoda subchelate; second having the dactylos wanting. Posterior pair of pleopoda biramous, the longer branch being bi-articulate. Telson double.

THE superior antennæ in this genus are much shorter than the inferior, having the basal joint greatly swollen, and its extremity oblique; hence the peculiar position which the second joint of the peduncle holds to the first, the articulation, instead of being at the extremity of the joint, being at the distal end of the inferior margin; thus the second articulates with the first joint almost at a right angle: the other two joints are generally short, and the flagellum is never long, and is furnished at its base with a secondary appendage. The inferior antennæ are much longer than the superior, and more slender. The mandibles are furnished with an appendage. The first pair of legs are subchelate. The

second are slender and have the finger wanting. The last pair of the caudal appendages terminate in two branches, one being short, the other long and bi-articulate. The central tail-piece is double.

This genus, as far as we know, is confined to the shores of Northern Europe.

By a singular coincidence, in all the specimens that we have seen the first pair of legs are damaged or wanting, so that we have not been able to determine their structure. We have, therefore, drawn up our character of this important organ from the figure and description of Lindström.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



BATHYPOREIA PILOSA.

Specific character. Inferior antennæ not half the length of the animal; flagellum not longer than the peduncle, consisting of six or seven unequal articuli. Fourth segment of the tail with a transverse sinus.

Length $\frac{2}{20}$ inch.

Bathyporeia pilosa.

LINDSTRÖM, Ofvers. Kongl. Vet. Akad. Forhandl. 1855, p. 59. Nat. Hist. Review, Jan. 1857, fig. c. WHITE, Pop. Hist. Brit. Crust. p. 188. SPENCE BATE, Cat. Amph. Brit. Mus. p. 172, pl. xxxi. fig. 4.

Thersites Guilliansonia. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 146.

THE superior antennæ have the first joint very broad, and longer than the head: the second joint is very short and narrow; it articulates with the first subapically upon the inferior surface: the third joint is still shorter and narrower than the second: the flagellum is about the same length as the peduncle; the first articulus being longer than the last joint of the peduncle, the remaining four or five being of irregular

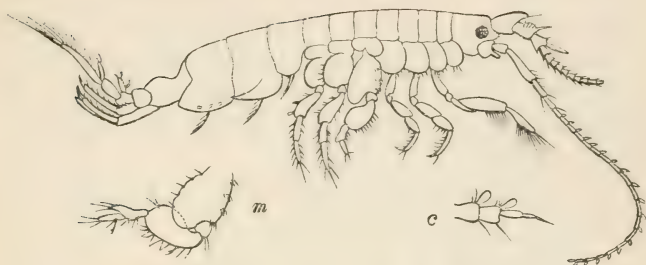
lengths. The inferior antennæ are more slender than, and nearly twice the length of, the superior, the peduncle reaching to the extremity of the superior antennæ; the flagellum, which consists of one long and four or five articuli of irregular lengths, is scarcely as long as the peduncle. The first pair of legs are wanting in the only specimens that we have been enabled to procure: but Lindström describes them as "having the wrist longer than the hand; the hand ovate, palm imperfectly defined." The second pair have the wrist very long, and ciliated upon the inferior margin; the hand is straight upon the upper margin, the palm, receding from the distal-pointed extremity, forms with the inferior margin a convex line, the anterior limit of which is fringed with extremely long cilia; the posterior is slightly excavated, suggesting that the hand is capable of being impinged against the preceding joint, and thus obtaining a feeble prehensile grasp, which it has otherwise lost by the absence of the moveable finger. The next two pairs of legs have the metacarpal joints and wrists much dilated; the hands are long and slender, and appear to have the capability of being bent back against the wrist; the fingers in these are short and strongly developed; a few hairs fringe the inferior margin of the hands and wrists. The next pair of legs have the thighs dilated towards the distal extremity; the metacarpal joint is broad, but the wrist is narrow, with its extremity produced externally to a point; the hand is long and narrow, having the margins parallel; and the finger is nearly as long as the hand. The thighs of the two succeeding pairs of legs are more broadly dilated than that of the preceding. The last pair of caudal appendages have one very long and one very short branch, the longer branch being

articulated about one-third from the apex, and tipped with a long spine-like hair. The central tail-piece has the inner margin of each division straight, the outer rounded, and furnished at the apex with one or two hairs.

We have only seen this animal when dead; but the skin is very thin and transparent, and appears to contain no colouring matter; neither have we been enabled to detect any eye. These circumstances, together with its having been hitherto taken only in muddy and sandy bottoms, suggest the idea that it is a burrower in the mud. It was first taken at Wisby, on a sandy bottom, at from eighteen to twenty fathoms of water, by Prof. Lindström, who also captured it at Lanskrona. It has been taken by Prof. Williamson, on a fine sandy bottom, off Weymouth; and Mr. Webster has dredged it near Tenby.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



BATHYPOREIA ROBERTSONI.

Specific character. Inferior antennæ more than half the length of the animal: flagellum three times as long as the peduncle: articuli numerous, and gradually increasing in length to the extremity of the antennæ. Fourth segment of the tail with a wide transverse sinus across the middle.

Length $\frac{1}{4}$ inch.

Bathyporeia Robertsoni. SPENCE BATE, Cat. Amph. Brit. Mus. p. 173, pl. xxxi. fig. 5.

THE eyes in this animal are round. The superior antennæ reach beyond the peduncle of the inferior; the flagellum is longer than the peduncle; and the articuli are regular in size, being nearly as broad as they are long, each supporting a short hair on the superior distal-extremity, and a short auditory cilium of an oval form: the secondary appendage consists of a single articulus, as long as four of the flagellum. The inferior antennæ are rather more than half the length of the animal: the last joint of the peduncle is much longer than the preceding; the flagellum is about three times the length of the peduncle; the articuli gradually increase in length and decrease in diameter; and every articulus supports upon the upper distal margin a small oval calceola, which, according to Mr.

Stimpson, is a character of the male sex. The rest of the animal bears a near resemblance to *B. pilosa*.

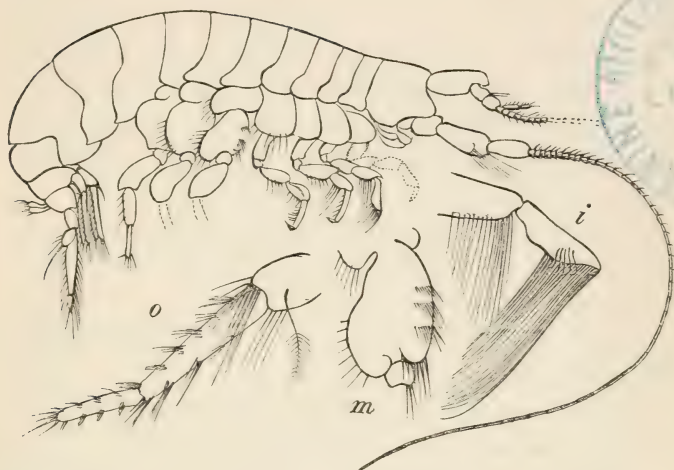
It was sent to us by our kind correspondent in compliment to whom we have proposed the specific name employed above. It was taken by Mr. Robertson in the month of February, in sand pools near low water mark at Cumbræ, N. B. He informs us that they were numerous, darting hither and thither.

Two specimens have since been dredged by our friend Mr. J. Gwyn Jeffreys in the Shetlands.

The observation of Mr. Robertson appears to overthrow our suggestion as to the burrowing habits of these animals mentioned in the description of the previous species. It is curious to remark that in this species the animal is furnished with distinct eyes in the specimen from Cumbræ, but not in those from the Shetlands which had been longer in spirits; it is, therefore, questionable whether the organs of vision had disappeared from the others after death (as they frequently do in some species) inasmuch as we received both specimens after they were dead.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



BATHYPOREIA PELAGICA.

Specific character. Inferior antennæ longer than the animal. Fourth segment of the tail entire.

Length $\frac{1}{4}$ inch.

Bathyporeia pelagica. SPENCE BATE, Cat. Amph. Brit. Mus. p. 174, pl. xxxi. fig. 6. WHITE, Pop. Hist. Brit. Crust. p. 188.

Thersites pelagica. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 146.

THE superior antennæ reach beyond the extremity of the peduncle of the inferior, but to what extent we are unable to determine, since they were mutilated at this point: the articuli are small and regular; the secondary appendage consists of two articuli, one being longer than the other, and both being as long as three or four of the articuli of the flagellum. The inferior antennæ are very long and very slender; the penultimate joint of the peduncle is longer than the ultimate; the articuli of

the flagellum are very short, and towards the base are broader than they are long. Like both the preceding species we have not been able to ascertain from observation the form of the first pair of legs; and all the rest bear a very close resemblance to those of *B. pilosa*. The caudal appendages appear to be more thickly furnished with hairs, a few of which about the animal are plumose.

We have only seen a single imperfect specimen of this species, taken in the Moray Frith, by the Rev. Geo. Gordon in a considerable depth of water.

Like *B. pilosa* this animal appears not to be furnished with distinct organs of vision.

The vignette below is from a drawing by W. E. Cooke, A.R.A., in the possession of J. Salter, Esq., it represents Stokes's Corner, North Haven, Poole Harbour, Dorsetshire.



AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—NIPHARGUS.

- Niphargus*. SCHÜDTE, Act. Soc. Reg. Dan. 1851, p. 26. Trans. Ent. Soc. Lond. 2 ser. v. i. p. 149. Nat. Hist. Review, i. p. 43. WHITE, Hist. Brit. Crust. p. 186. SPENCE BATE, Cat. Amph. Brit. Mus. p. 174.
- Gammarus part.* KOCH, Crust. Myr. u. Arach. Deutschl. h. 5 and 36. COSTA, Mem. d. reale Accad. d. Sci. Napoli. 1.

Generic character. Animal slender. Eyes obsolete or rudimentary. Superior antennæ having a secondary appendage. Inferior antennæ shorter than the superior. Gnathopoda uniform, chelate or subchelate. Posterior pair of pleopoda biramous; one ramus rudimentary, the other very long and double-jointed. Telson single, deeply cleft.

THE animals of this genus are much compressed, slender in form, and colourless creatures. The eyes are wanting or rudimentary.* The superior antennæ are very slender, longer than the inferior, and carry a very small secondary appendage. The mandibles are furnished with a tri-articulate appendage; and the foot-jaws have the squamiform plates but slightly developed.†

* Caspary (Verhandl. d. Naturf. Vereins für Rheinland, Jahrg. 6.) and Hosius (who kept specimens of *N. puteanus* alive for many weeks) were unable to detect any traces of eyes; but Gervais (Ann. Sci. Nat. 2 ser. iv. p. 128) considered that the species possessed eyes although destitute of coloured pigment. In all that we have kept alive, some for several weeks, as in *N. fontanus*, they are imperfectly formed and of a lemon colour.

† The first and second maxillæ and the foot-jaws do not materially differ from those of *Gammarus pulex*. Hosius indeed figures the first maxilla in *N. puteanus* as having a very slender ex-articulate palpus, but our dissections agree with those of Schiödte, showing the palpus to be broad and two-jointed. It is probable that the specimen of *N. puteanus* dissected by Hosius was immature, as the palpus in very young specimens of *G. fluviatilis*, as also figured by Hosius, is also slender, and with the joints only indistinctly exhibited.

The hands of the first two pairs of legs are nearly of the same size and form. The legs are of different lengths, the last pair being the longest. The ante- and penultimate pairs of caudal appendages are short—their branches being about the length of the peduncle—and equal; whilst those of the last pair are unequal, one being very minute and the other extremely long, especially in the male; * it is also double-jointed. The central tail-piece is single, but cleft down the centre.

The earliest specimen of these subterranean Amphipoda was that recorded by Dr. Leach as having been found in a well attached to St. Bartholomew's Hospital. But this was looked upon rather in the light of a strange occurrence than the establishment of a fact in the habits of these creatures.

Between the years 1835 and 1842, Koch, in the continuation of Panzer's great work on the Insects of Germany, published descriptions and figures of two species which he procured from the draw-wells of Ratisbonne and Zweibrücken, under the single name of *Gammarus puteanus*. In 1851 Schiödte obtained other specimens from the Caves of Carniola; and to him is due the credit of establishing this interesting genus among the Amphipod Crustacea. In the year 1852 Prof. Westwood was so fortunate as to obtain from a pump with a substratum of clay, near Maidenhead, a quantity of these animals, since which they have been found in Hampshire, Wiltshire, Kent, Surrey, Dorsetshire, Devonshire, Worcestershire, and very recently in Dublin.

In all these instances the British examples have been

* It is upon the authority of Schiödte that we assert that the males in this genus differ from the females in the length of the last pair of caudal appendages, since we have not procured a specimen which we could determine upon other evidence to be female.

obtained from artificially-excavated wells connected with houses for domestic purposes. In some instances the wells have been old, in others but recently dug.* In their geological condition the habitats have been equally various. At Corsham the well exists in the Oolite formation, at Ringwood in chalk-flint gravel, at Mannamead in slate.† At Corsham and Mannamead they are found on a hill, at Ringwood they lie low.

The appearance of some of these animals in a well soon after its being excavated, raises a question of considerable interest. Thus they were found at Upper Clatford, near Andover, and at Mannamead,‡ near Plymouth, but not a trace of them was to be found in the surrounding streams; in fact, they perish in the light. It is impossible to regard them as an extreme variety, or modification of our only fresh-water Amphipod, *Gammarus fluviatilis*, since various parts not only differ in form but some are altered in character; for example, the extraordinary elongation and slenderness of one of the branches of each of the

* By a misprint in the Catalogue of Amphipoda of the British Museum (p. 177), the pump at Upper Clatford is said to have been very recently *dry* instead of recently *dug*. The difference in the habits of the animal implied in these two terms requires the correction of the error.

† Shortly after the exhibition of the specimens from Maidenhead, at the Linnean Society, Mr. Edwin Lees informed us of the discovery by himself of a specimen in water from the well of his own residence, in Cedar Terrace, Henwick, Worcester. This well had been deepened in the preceding year into the red marl, which is the formation under gravel. The animal had not been previously seen, and only a single individual was observed. On the other hand, the specimens captured by Mr. Herbert Mullins were obtained from a well thirty feet deep, in an underground cellar, in the middle of the house at Corsham, built about 1668, known as Lady Mary Hungerford's Charity: the water is stated to be much impregnated with iron, and curdles with soap.

Mr. Hogan states that they are found at all seasons of the year, but are most abundant towards the close of the autumn.

‡ Since this has been in the press we are informed by our friend, Mr. Charles Stewart, that they exist very numerously in an old well at Hartly, which is half-a-mile from Mannamead, but in the same geological formation.

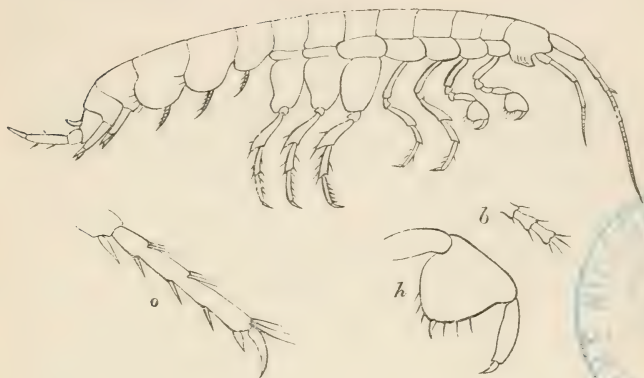
last pair of caudal appendages seems to be a special structure, having for its object the antenna-like use of a delicate apparatus at the extremity of the body, in the same way as the conical appendages at the extremity of the body of the *Orthoptera* are developed in the mole-cricket into a pair of elongated setose filaments. If the *Niphargus* were simply a modified *Gammarus*—which has two equal-sized branches to each of the same pair of caudal appendages—one cannot understand why both the branches should not have been equally increased, instead of one being almost obsolete and the other immensely developed as it is in *Niphargus*, or why it should obtain an additional joint. It would be easy to say, that as the mole-cricket has only need of two anal feelers, the *Niphargus* requires only two, and therefore that one of the branches in each pair of the *Gammarus* has become developed by use, and the other obsolete by disuse; but as the *Niphargus* has four frontal antennæ, whilst the mole-cricket has only two, the former should use four anal feelers instead of two. We must here also allude to the excellent manner in which Hosius combats the opinion of M. Gervais, that this species is only a variety of his *Gammarus pulex* which has remained in a state of imperfection from dwelling in deep dark wells.

Although we can find no fresh-water ally to this genus in the rivers and streams of Europe, yet Bruzelius has taken in the deep sea, near Bohusia, a form which he has described under the name *Eriopis elongata*, approximating so nearly to it that it appears to be scarcely generically distinct.

We are inclined to think that *Gammarus pungens* of Milne Edwards, from the warm springs of Cassini in Italy, also belongs to this genus.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



NIPHARGUS AQUILEX.

Specific character. Very long and slender. Coxæ of all the legs not so deep as the segments to which they are attached. First three segments of the tail nearly of equal depth, with their posterior angles rounded. Gnathopoda very small and equal, having the propoda triangular; the superior and inferior margins and palm being of nearly equal length, with the angles rounded off. First and second uropoda very short.

Length $\frac{1}{3}$ inch.

Niphargus aquilex.

SCHIÖDTE, Comm. Soc. Reg. Dan. 1855, p. 350.
Nat. Hist. Review, i. p. 41, fig. B. WHITE,
Hist. Brit. Crust. p. 187.

Niphargus stygius.

WESTWOOD, Proceed. Linn. Soc. No. li. p. 218,
April 19, 1853. SPENCE BATE, Ann. Nat.
Hist. 2 ser. xix. Cat. Amph. Brit. Mus. p. 174,
pl. xxxii. fig. 1. (but query of Schiödte.)

Gammarus puteanus, var.

KOCH, in Contin. of Panzer, Ins. Germ. No. 186,
pl. 22; and Deutschl. Crust. Myr. u. Arach.
heft 36, No. 22.

Gammarus puteanus.

DE LA VALLETTE ST. GEORGE, De Gammaro
puteano, pl. i. fig. 5.

Gammarus puteanus.

CASPARY, in Verhandl. d. Naturf. Vereins für
Rheinland, Jahrg. 6, Bonn, 1849, p. 39,
t. 2, f. 1-19. HOSIUS, De Gammarum Specie-
bus, Diss. Acad. 26 Jul. 1850, Bonnæ, p. 20,
tab. 1, fig. 7, 12. tab. 2, fig. 22; also in Wieg-
mann's Archiv. 1850, i. p. 235.

- Gammarus pulex minutus.* GERVAIS, Ann. Sci. Nat. 2 ser. iv. p. 128.
Gammarus longicaudatus. COSTA, Recherche sui Crost. Anf. Napoli, in
 Mem. d. Reale Accad. Scienz. Napol. vol. i.
 tav. iv. fig. 6.
Gammarus subterraneus. LEACH, Edin. Encyc. vii. p. 403.

THE body of the animal is long and very narrow. The postero-inferior angles of the three anterior segments of the tail are rounded, and furnished with three or four equidistant hairs. The superior antennæ are not half the length of the animal; the flagellum being twice as long as the peduncle. The inferior antennæ are more than half the length of the superior; the peduncle being longer than the peduncle of the superior. The coxæ of the legs are about half the depth of the respective segments of the body. The first two pairs of legs are very small, and of the same size and form; the wrists are infero-anteriorly hollow, to receive the posterior margin of the hands; the hands are of a triangular form, the three sides being nearly of equal length, the angles being rounded off, the upper edge slightly, and the lower edge considerably rounded, the palm is defined by a strong spine, a few hairs also fringe both the palm and the inferior margin. In a specimen captured at Leyden, by Prof. Westwood,* those upon the inferior margin form about seven distinct fasciculi, whilst those on the palm are very regularly equidistant, and more numerous than are represented in our figure, drawn from one of the dried Maidenhead specimens, presented by Prof. Westwood to the British Museum. The fingers are robust, and furnished with a distinct nail. The walking legs bear a normal resemblance to those of the typical genera of the order, but in detail

* I am not quite satisfied of the identity of the Leyden and Maidenhead specimens.—I. O. W.

the hands of the first two pairs are not furnished with spines, whilst those of the three last are; and (as shown at fig. *o*) the inner margin of the leg is furnished with several short sharp strong spines, while the outer margin carries two or three fasciculi of hairs; and the finger is furnished with a distinct nail. The posterior pair of caudal appendages are very long: the peduncle is short, and the inner branch rudimentary, whereas the outer one in the male is nearly one-third of the length of the animal, but in the female (represented in our illustration of the species) it is very much smaller; in the former the second joint is nearly as long as the first, in the latter it is scarcely half of its length.

This animal was first recorded in England by Prof. Westwood, a correspondent having forwarded specimens to him from a pump near Maidenhead; these he exhibited at the Linnæan Society on the 19th April, 1853, considering them as identical with the *Niphargus stygius* of Schiödte, of which he had not seen a specimen. Mr. Spence Bate has fallen into a similar error, having been misled by the imperfect copies of the insufficient or inaccurate figures and description of Schiödte, in the first volume of the Dublin Natural History Review, especially the carinated dorsum of *S. aquilex*, and the identity in the form of the hands in Schiödte's figures of the two species.

When Schiödte was in England, specimens from Maidenhead were presented to him by Prof. Westwood; these he pronounced to be a distinct species from the well shrimps of Carniola, Schiödte giving as one of its characters, "dorso carinato." We have, indeed, observed, that when dried on card, the backs of the more delicate of these animals shrink into a ridge (whence the origin of Schiödte's misstatement). The other charac-

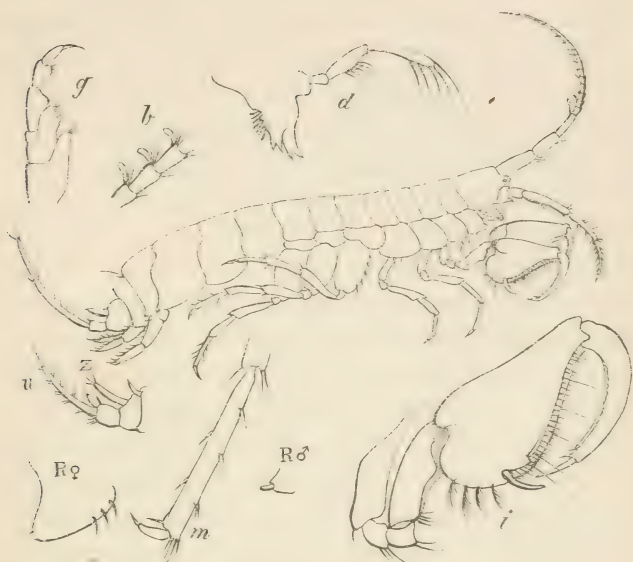
ters of *N. aquilex*, however, given by Schiödte, which we have verified and introduced into our specific character, in addition to the remarkably beautiful series of details of *N. stygius* published by Schiödte, leave but little doubt in our minds of the correctness of his views in considering the Maidenhead specimens as belonging to a distinct species.

In addition to the Maidenhead locality mentioned above, we have received a specimen captured at Wandsworth, Surrey, from Mr. W. W. Saunders; also from Mannamead, near Plymouth (where the long and short tailed specimens are associated), and have taken it in pump water at Leyden, where also Dr. Herklots has taken two specimens (preserved in the Leyden Museum); Caspary found it abundantly at Elberfeld; Hosius at Bonn; the Baron De la Vallette St. George in a well at Cologne in considerable numbers in November and December; Correnzio at Munich; and Koch obtained it from the draw-wells about Zweibrücken.

Koch's figure of the animal is coloured of a pale greenish grey; but Mr. White says, in his History of British Crustacea, that it is snow-white.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



NIPHARGUS FONTANUS.

(Hogan's Pump Shrimp.)

Specific character. Moderately robust. Coxæ of the first four pairs of legs nearly as deep as the segments to which they are attached. Gnathopoda having the propoda pear-shaped, with the palm oblique, and as long as the superior margin, which is nearly straight; inferior margin convex and posteriorly produced; palm defined by one or two moveable spines. Anterior segments of the tail with the posterior angles pointed.

Length $\frac{1}{2}$ inch.

Niphargus fontanus. SPENCE BATE, Proceed. Dubl. Univ. Zool. and Bot. Assoc. 1859. Nat. Hist. Rev. vol. vi. p. 165, fig. 2. Cat. Amph. Brit. Mus. p. 175, pl. xxxii. fig. 2. HOGAN, Proceed. Dubl. Univ. Zool. and Bot. Assoc. 1859. Nat. Hist. Rev. vol. vi. p. 166.

THIS species is much more robust than the preceding. The three anterior segments of the tail have the postero-inferior angle produced to a point, apically furnished in

the male with a short stout spine, in the female subapically with a fine hair. The eyes are very small, irregularly defined in form, and, in the living animal, of a bright lemon colour, showing very brilliantly in certain positions. The two pairs of hands are similarly shaped, somewhat resembling a pear, but the second pair are slightly larger than the first: they have the superior margin almost straight; the palm is very oblique and slightly waved, marginate,* and fringed with a row of numerous equidistant short cilia, and a few solitary hairs; defined by—two in the first, and one in the second—strong moveable spines, the posterior margin is very convex, and produced posteriorly to the carpal articulation, it is fringed with four fasciculi of anteriorly curved hairs, and is capable of being compressed into a deep excavation on the anterior margin of the wrist; the finger is long, curved, marginate upon the inner surface, and furnished with a distinct nail, the point of connection with the finger being defined by a sharp tooth. The posterior walking legs, instead of having the anterior margin furnished with spines, have small fasciculi of hairs. The elongated branch of the last of the caudal appendages is not so much developed as in *N. aquilex*. In other respects this animal bears a close resemblance to that species.

This species was first taken by the Rev. A. R. Hogan, at Ringwood in Hants, in a pump-well sunk about fourteen years since, but there existed another well of much older date, at the distance of a few feet, that had been long closed up. It was also taken by Mr. Herbert Mullins (who has kindly presented specimens to us and

* The term *marginate* is used to express the presence of a well-defined margin that frequently varies in appearance, and resembles a thin cutting edge.

to the Hope Collection at Oxford) in a similar well about two hundred years old at Corsham in Wiltshire, as above-mentioned. Mr. Lubbock has also taken it in a well at High Elms in Kent.

Through the kindness of Mr. Hogan, who sent us living specimens, we were enabled to watch it alive for many weeks. There appeared little in the habits of this creature that distinguished it from the common Gammarus of our fresh-water streams, for even its desire to seek the darkness (and Mr. Hogan informs us that it soon dies if exposed to the light) is but an exaggeration of the habits of these crustacea to hide themselves beneath rocks, stones, and weed.

We observed, when watching the animal very closely, that the strong spines, which define the limits of the palm on the first two pairs of hands, are moveable.

The colour of the animal is of a milky hue, but not quite white. The eyes are brimstone yellow, small, and irregularly formed.

If we are correct in following Schiödte in assuming that the difference of length in the posterior caudal appendages of certain specimens indicate sexual distinction, it is at least a curious circumstance that the long-tailed form was not found associated at Corsham and Ringwood; the males, if such they were, being found at Corsham in Wiltshire,* and the females taken at Ringwood in Hampshire.

In the "Catalogue of Amphipoda of the British Museum," we have stated that the males also differ from the females in having the second pair of hands less tapering and graceful; but we find that it is the females

* Among the specimens presented by Mr. Mullins to the Hope Collection, is a female with the terminal segments as represented in our figure *u* 2.

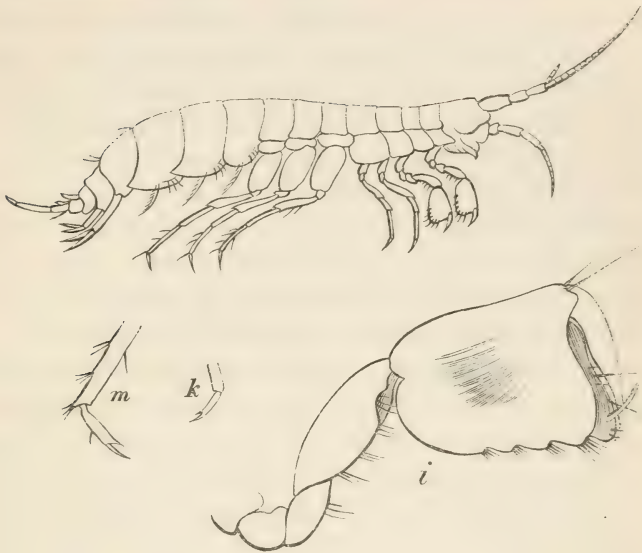
which have the shorter and less distinctly pear-shaped hands.

Professor Westwood thinks that this species may be identical with the *N. stygius* of Schiödte, since both agree in the more robust form of the animal and the shape of the hands: there are, however, other important differences; as for instance, the form of the second and third segments of the tail, which, together with the diversity of habitat, will probably prove to be of specific value.

AMPHIPODA.

GAMMARIDES.

NATATORIA.



NIPHARGUS KOCHIANUS.

Specific character. Coxæ of the first four legs as deep as the segments, to which they are attached. Gnathopoda having the propoda subquadrate, longer than broad, narrowest at the base: palmæ anteriorly produced. Second and third segments of the pleon having the posterior angle pointed.

Length $\frac{1}{3}$ inch.

Niphargus Kochianus. SPENCE BATE, Proceed. Dub. Univ. Zool. and Bot. Assoc. 1859. Nat. Hist. Rev. vol. vi. p. 165, fig. 1. Cat. Amph. Crust. Brit. Mus. p. 177, pl. xxxii. fig. 3. HOGAN, Proceed. Dub. Univ. Zool. and Bot. Assoc. 1859. Nat. Hist. Rev. vol. vi. p. 166.

THIS species bears in its general aspect a very close resemblance to those already described. It differs from *N. aquilex*, while it agrees with *N. fontanus*, in having the

infero-posterior angle of the second and third segments of the tail produced to a point. The superior antennæ are about two-thirds the length of the animal, exclusive of the long caudal appendage; being rather longer than represented in the figure illustrative of this description. The inferior antennæ are about half the length of the superior, but the flagellum is as long as the peduncle. The hands of the second pair of legs are scarcely appreciably larger than those of the first. They approach in form an imperfect oblong square, the narrowest diameter is nearest the wrist, the broadest at the palm; the inferior margin is longer than the superior, and furnished with four fasciculi of hairs, each standing upon its own protuberance, and increasing in length as they approach the palm; the palm is produced anteriorly as it approaches the inferior angle, with which it obtusely forms an angle somewhat less than a right angle, a short distance within which stands a long stout double-pointed spine, against which laterally the finger impinges when closed. The fingers of the last three pairs of walking legs are distinctly unguiculate, the point at which the nail originates being defined by a sharp tooth. There appears little else that can distinguish this from the preceding species, with which it was found associated in an old pump at Ringwood, as well as unmixed with any other species in a well but recently dug at Upper Clatford, near Andover, Hants, by the Rev. Mr. Hogan, who has kindly presented specimens to us as well as to the Hope Museum at Oxford. We have also been favoured with specimens caught in water from a pump at Warminster, Wilts, by Miss Margaret E. Slent; and since this has been in the press Professor Kinahan has sent us specimens taken in great abundance in an old well sunk in limestone in Dublin, in which a

few individuals had been observed many years ago. A larva is also found in the well, which is stated by the proprietor to feed on the *Niphargi*.

It is named in compliment to the distinguished naturalist, who first described and figured two of these peculiar and interesting little animals.

We are inclined to think this species identical with the specimens captured at Bonn, described and figured by Caspary and Hosius, referred to in the synonyms under *N. aquilex*, but want of specimens from that locality prevent our determining this point.

The vignette represents a well similar to those in which these animals are frequently found.



AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—CRANGONYX.

Crangonyx. SPENCE BATE, Proceed. Dubl. Univ. Zool. and Bot. Assoc.
1859. Nat. Hist. Rev. vol. vi. p. 165. Cat. Amph. Crust.
Brit. Mus. p. 178.

Generic character. Superior antennæ having a secondary appendage. First pair of gnathopoda rather larger than the second. Posterior pair of pleopoda unibranched, not longer than the preceding pair. Telson single, entire.

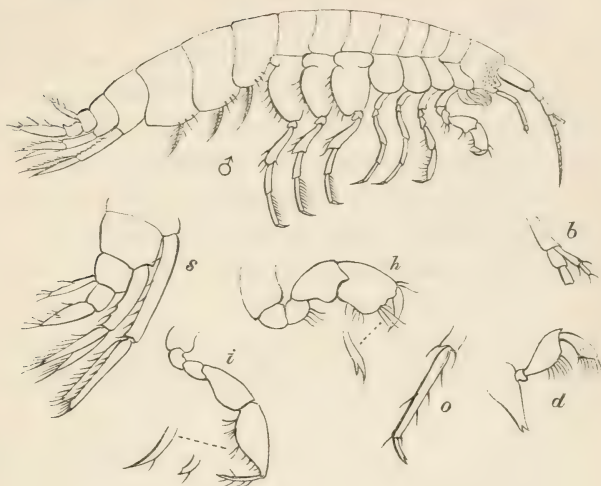
IN this genus the eyes are imperfectly developed. The superior antennæ are not much longer than the inferior, but rather more robust, and furnished with a secondary appendage. The first two pairs of legs are small, rather unequal in size, and subchelate. The caudal appendages are short, and the last pair terminate in a single branch, not longer than the preceding pairs. The terminal central plate is also single.

This genus, like the last, belongs to the subterranean Fauna. A single species as yet is all that has been found in England; but we have little doubt but that *Gammarus Ermanni* of Milne Edwards, which was found by M. Ermann in the warm springs of Kamschatka, belongs also to this genus.

It is curious that we should have to record, that while the animals of this genus (as in the preceding) inhabit the deep artificial wells, without being known to exist in our rivers and streams, its nearest allied form is to be found in a marine genus, *Gammarella*.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



CRANGONYX SUBTERRANEUS.

Specific character. Superior antennæ more robust than the inferior; flagellum not longer than the peduncle; secondary appendage biarticulate. First pair of gnathopoda larger than the second. Posterior pair of pleopoda scarcely reaching beyond the telson.

Length $\frac{4}{20}$ inch.

Crangonyx subterraneus. SPENCE BATE, Proceed. Dubl. Univ. Zool. and Bot. Assoc. 1859. Nat. Hist. Rev. vol. vi. p. 166, fig. 3. Cat. Amph. Crust. Brit. Mus. p. 178, pl. xxxii. fig. 6.

THIS animal is not so slender as the species of the genus *Niphargus*. The eyes are imperfectly formed, and distinguishable by some small irregular patches of lemon-coloured pigment. The superior antennæ are about one-fourth the length of the animal, having the flagellum as long as the peduncle, and furnished with a two-jointed secondary appendage. The inferior antennæ are not perfect in the only specimen that we have seen, but

what exists of these is more slender than the superior. The first pair of legs have the hands quadrate, the palm slightly convex, oblique, armed with a few small hairs. The second pair are not so large as the first, having the hand long and narrow,* the palm very oblique, and imperfectly defined. The rest of the animal exhibits no remarkable features, except in the shortness of the last or single-branched caudal appendage, which does not reach beyond the extremity of the preceding pair, and scarcely beyond that of the central tail-piece which is rather narrow.

The only specimen that we have seen of this species was procured by the Rev. H. R. Hogan from a pump at Ringwood.

* Our enlarged fig. *i* represents the form of the second pair of hands more correctly than the figure of the entire animal.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—GAMMARELLA.

- Gammarella*. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 143. Cat. Amph. Crust. Brit. Mus. p. 179. WHITE, Hist. Brit. Crust. p. 181.
- Gammarus part.* DANA, U. S. Explor. Exped. p. 956.

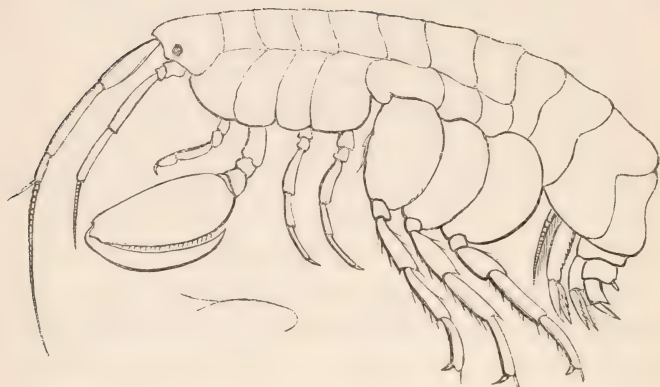
Generic character. Superior antennæ furnished with a secondary appendage. Gnathopoda very unequal in size in the male, subchelate. Posterior pair of pleopoda unibranched. Telson single cleft.

THE superior antennæ in this genus are longer than the inferior, and furnished with a secondary appendage. The hands of the first two pairs of legs are subchelate. The caudal appendages have their branches short, the last pair are furnished with but a single branch. The central tail-piece is single, but divided at the apex.

This genus forms a curious link between the family *Orchestiidae*, and the subfamily *Gammarides*, possessing, as it does, the superior antennæ of *Gammarus*, and caudal appendages similar to those of *Orchestia*. It moreover appears to differ from *Crangonyx* only in having the second pair of hands in the male larger than the first.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



GAMMARELLA BREVICAUDATA.

Specific character. Superior antennæ half the length of the animal. Inferior antennæ scarcely longer than the peduncle of the superior. First pair of gnathopoda small; second pair having the propodos very largely developed. Posterior pair of pleopoda having the ramus not longer than the peduncle. Telson as broad as long.

Length $\frac{1}{2}$ inch.

- | | |
|-----------------------------------|---|
| <i>Gammarus brevicaudatus.</i> | MILNE EDWARDS, Ann. des Sci. Nat. t. xx.
p. 369. Hist. des Crust. t. iii. p. 53. |
| <i>Gammarella brevicaudata.</i> | SPENCE BATE, Cat. Amph. Crust. Brit. Mus.
p. 180, pl. xxxii. fig. 8. |
| <i>Gammarella orchestiformis.</i> | SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 143.
WHITE, Hist. Brit. Crust. p. 181. |
| <i>Gammarus punctimanus.</i> | COSTA, Mem. Reale Accad. d. Sci. di Napoli,
vol. i. tav. iii. fig. 6, 1853. |

THE dorsal surface in this species is slightly elevated at the posterior portion of each segment, especially in the fourth segment of the tail, owing chiefly to the smallness of the two succeeding segments, which appear

suddenly to decrease in size. The eyes are small and round. The superior antennæ are about half the length of the animal; the flagellum is about the same length as the peduncle; the secondary appendage consists of four articuli. The inferior antennæ scarcely reach beyond the extremity of the peduncle of the superior; the flagellum is not longer than the last joint of the peduncle. The first pair of legs are very small and slender. The second, as if to compensate for the insignificant character of the first, are extremely large, the hand being nearly equal in length to the head and first three segments of the body, it is of a long oval form, slightly tapering to the distal extremity; the palm occupies the whole length of the inferior margin: the finger is very long and robust, and the wrist is extremely short. The last three pairs of legs have the thighs dilated into broadly oval plates; and the fingers are short and strong, and articulated, with the hands at the anterior margin of the distal extremity. The caudal appendages are short, the branches being shorter than the peduncles, the last being single branched, a strong spine being probably the rudiments of the obsolete second branch. The central tail-piece is broad, divided nearly to the base, having each division subapically crowned with a short spine.

The animal is of a dark olive-green colour. Under the microscope the surface is seen to be covered with stiff hairlike processes and spots; these last being the result of small groups of little spinules.

We have but little hesitation in referring *Gammarus punctimanus* of Costa to this species, although that author represents the upper antennæ as destitute of a supplemental appendage.

The animal was first taken at Morbihan, on the coast of France, by M. Milne Edwards. It has since been

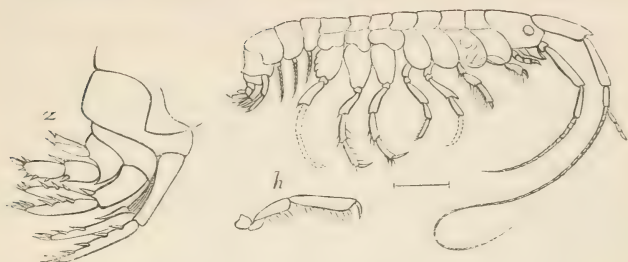
sent to us by Mr. Loughrin, who took it at Polperro. Not having then seen the type of the species it was described by us under another name ; but more recently we have taken advantage of an opportunity to examine the original specimen, and no doubt is left on our minds that the British form is identical with that found on the coast of France, described by M. Edwards.

The following vignette represents an incident in the pursuit of science that befell one of the authors near the Lizard Point, Cornwall.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



GAMMARELLA NORMANNI. N.S.

Specific character. Like *G. brevicaudata*, except that the flagella to the antennæ are longer, and the second pair of gnathopoda not larger than the first.

Length $\frac{3}{20}$ inch.

THIS animal bears so close a resemblance to the preceding, that we are inclined to think that it may only be the female of that species.* The difference of certain parts, however, which seldom vary in individuals of the opposite sexes, induce us provisionally to describe it as the female of a distinct species, until future research shall demonstrate its true relation to *G. brevicaudata*.

The chief differences are, that in this species the superior antennæ are nearly as long as the animal; the flagellum being nearly as long again as the peduncle; and the secondary appendage is longer than the last joint of the peduncle. The inferior antennæ have the peduncle as long as the peduncle of the superior, and the flagellum is as long as the peduncle. The first two pairs of legs are small and similarly formed; the wrists are long and narrow, and the hands are not broader than the

* In this opinion we are supported by the statement of Dana, that the female of *Gammarella* (*Gammarus*) *pubescens* has the second pair of hands but little larger than the first.

wrists; the palms are slightly oblique, and the fingers very short. The rest of the animal bears so close a relation to the preceding that it is quite unnecessary to describe it further.

This animal, of which only a single specimen has been taken, was sent to us from our valued correspondent, the Rev. A. M. Norman, who dredged it in Moulin Huel Bay, Guernsey, in about ten fathoms, on sand and *Zostera*.

It receives its specific name in compliment to the finder, who has been so liberal as to present us with this and many other specimens as well as to place at our disposal for this work the results of his numerous dredgings in this order of Crustacea.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—MELITA.

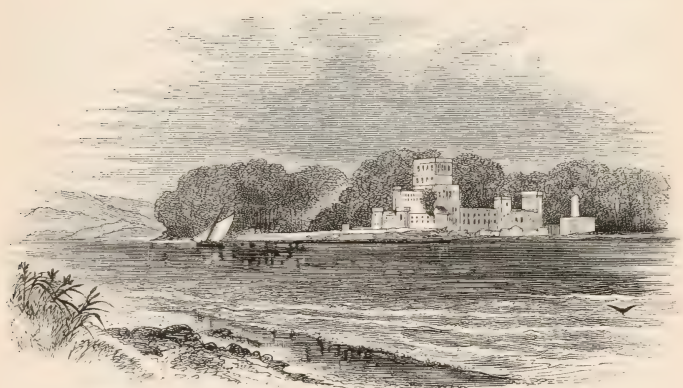
- Melita.* LEACH, Edin. Encyc. Art. Crust. p. 403, and Append.
p. 432. Trans. Linn. Soc. xi. p. 358. DESMAREST,
Consid. sur les Crust. p. 265. SPENCE BATE, Cat.
Amph. Brit. Mus. p. 181 (not of *Dana*).
Ceradocus. COSTA, Rend. della Reale Accad. delle Scienze di Napoli,
1853, p. 170.
Mæra. DANA, U. S. Explor. Exped. p. 965.
Gammarus part. MILNE EDWARDS, Hist. nat. Crust. iii. p. 54. LILJEBORG,
Ofvers, &c. 1854, p. 452. BRUZELIUS, Skand. Amph.
p. 56. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 144.

Generic character. Superior antennæ longer than the inferior, having a secondary appendage. Second pair of gnathopoda very large in the male. Posterior pair of pleopoda having the internal ramus rudimentary, the outer very long. Telson double.

THE eyes in this genus are round, and not very large. The superior antennæ are furnished with a secondary appendage. The inferior antennæ are scarcely longer than the peduncle of the superior. The second pair of legs are furnished, in the male at least, with a very large hand; and the finger generally impinges somewhat within the margin of the palm. The walking legs are nearly of the same length; and the three posterior pairs have frequently the fingers directed backwards. The posterior pair of the caudal appendages have the branches very unequal; the outer one being very long, the inner very short, and frequently rudimentary, as in the typical species. The central tail-piece is double.

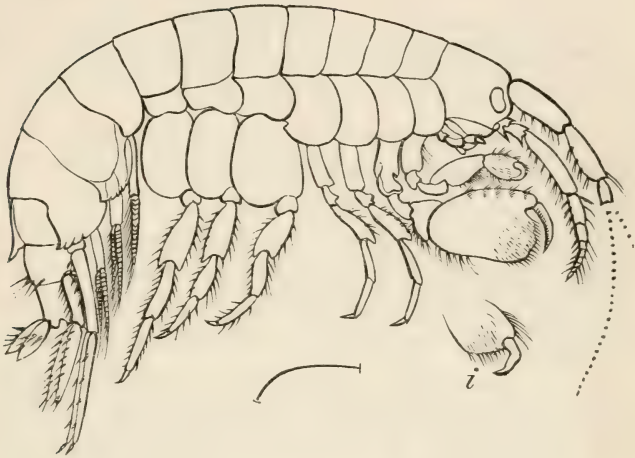
In our observations on this genus, we have noticed specimens corresponding in form and character with the above description, except in having the second pair of hands scarcely larger than the first. These we consider to be the females of the various corresponding specimens possessing the large hands, with which they nearest agree.

The following sketch of Banksea Castle, seen from North Haven, Poole Harbour, Dorsetshire, is from a drawing by E. W. Cooke, A.R.A., in the possession of J. Salter, Esq.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



MELITA PALMATA.

Specific character. Fourth segment of the pleon having a dorsal tooth. Second pair of gnathopoda having the dactylos shorter than the palm, and impinging against the internal surface. Posterior pair of pleopoda very long, having the inner ramus rudimentary.

Length $\frac{3}{8}$ of an inch.

Cancer (Gammarus) palmatus. MONTAGU, Trans. Linn. Soc. vii. p. 69, t. 6. fig. 4.

Melita palmata. LEACH, Edin. Encyc. Art. Crust. vii. p. 403. Trans. Linn. Soc. xi. p. 358. Suppl. Enc. Brit. 1, p. 425, pl. xxi. DESMAREST, Consid. sur Crust. p. 264, pl. xlv. fig. 7. SAMOUELLE, Ent. Comp. p. 103.

Gammarus Dugesii. MILNE EDWARDS, Ann. des Sci. Nat. xx. p. 368. Hist. des Crust. t. iii. p. 54. ZADDACH, Synop. Crust. Pruss. p. 6.

Gammarus palmatus. LILJEBORG, Ofvers. af Kongl. Vet. Akad. Forhandl. 1854, p. 453. Frey u. Luckart. Beitr. z. Kenntn. Wirbellos. Thiere, p. 162 (from *Bruzelius*). MILNE EDWARDS, Hist. des Crust. t. iii. p. 55. SPENCE BATE, Brit. Assoc. Rep. 1855, p. 58. Synop.

Gammarus inæquimanus.

Brit. Edrioph. Crust. Ann. Nat. Hist.
2 ser. xix. p. 144. Cat. Amph. Crust.
Brit. Mus. p. 182, pl. xxxiii. fig. 2.
WHITE, Pop. Hist. Brit. Crust. p. 184.
BRUZELIUS, Skand. Amph. Gamm. p. 56.
SPENCE BATE, Ann. Nat. Hist. 2 ser. xix.
p. 145. WHITE, Pop. Hist. Brit. Crust.
p. 185.

THE fourth segment of the tail is posteriorly armed with a small central tooth, and the fifth with two very minute ones. The eyes are almost round. The superior antennæ are rather more than half the length of the animal, terminating in a flagellum not so long as the peduncle, and furnished with a short triarticular secondary appendage. The inferior antennæ have the peduncle as long as that of the superior, but the flagellum is much shorter than the flagellum of the superior. The first pair of legs have the hands but slightly dilated, whilst those of the second are very large. In the second pair the palm is convexly produced at the extremity to an extent equal to the length of the finger, and rounded off obtusely at the inferior angle, with which it lies at a right angle; the inferior margin is straight and furnished with fasciculi of hairs, while the upper is arcuate and clean; the inner side of the hand is concave: and the short curved and pointed finger impinges against the middle of the joint (as shown in the vignette) instead of against the palm or anterior margin as is usually the case; the outer surface of the hand is convex; and when the organs are at rest they act the part of a boxlike shield for the protection of the oral and anterior appendages. The three posterior pairs of legs are strong and fringed with hairs; the thighs being slightly serrated upon the posterior margins. The ante and penultimate pairs of caudal appendages are short, especially the latter, whilst the ultimate (which were broken off in the specimen

represented in our figure at the head of this description, but which are shown in the vignette at page 340) are very long; the branches are unequal, the smaller being almost obsolete and the larger fringed with short stout hairs, or pointed spines, subapically tipped with a solitary cilium. The terminal or central tail-piece is double.

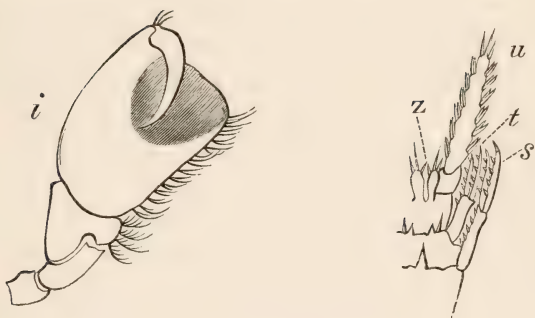
This description is taken from a typical specimen, whilst the figure represents the *Gammarus inæquimanus* of Mr. Spence Bate's Synopsis, but which he is now satisfied is evidently this species, with one of the second pair of legs imperfectly developed, (whence the specific name,) after having been lost through some probable injury.

Melita palmata was first taken by Col. Montagu, and described and figured in the Linnæan Transactions; but Dr. Leach separated it, very properly, from the genus *Gammarus*, to which Montagu assigned it, and proposed the present one for it. Montagu's figure was drawn from a very imperfect specimen, and hence this species has been mistaken by authors, although he exactly represents the peculiar manner in which the finger folds upon the inside of the hand of the second pair of feet.

We have through the kindness of Professor Milne Edwards examined the type of his *Gammarus Dugesii*, and have no doubt of its identity with the present species.

This species appears to be by no means plentiful, even in the localities in which it is found. Montagu took it on the southern coast of Devon, probably at Salcombe; Dr. Leach records it from Plymouth; and we have received it from Poole, taken by Mr. Salter; from Polperro, by Mr. Loughrin; and from Cultrea, co. Down, and Dublin Bay, Ireland, by Prof. Kinahan.

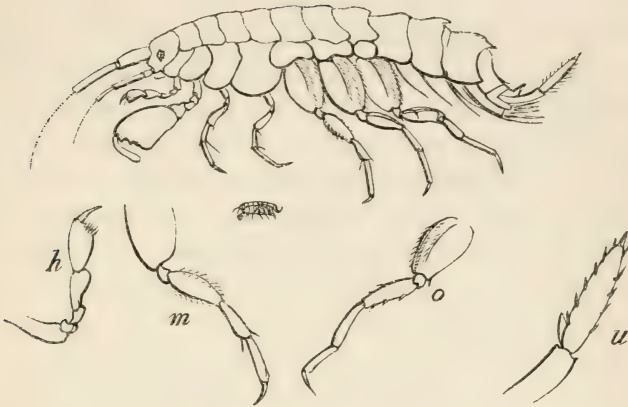
Prof. Milne Edwards's specimen (which he has described under the synonym of *G. Dugesii*) is from the coast of Brittany. Bouchard-Chantereaux gives it, under its proper name, as a native of the coast near Boulogne-sur-Mer, where it is found under stones; its colour being nearly black, the eyes rather white, and the eggs brown; and Prof. Zaddach records it under the name of *G. Dugesii*, "prope Gedanum" in the Baltic.



ONE OF THE SECOND PAIR OF HANDS AND TAIL OF *M. PALMATA*.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



MELITA OBTUSATA.

Specific character. Second, third, fourth, and fifth segments of the pleon having small teeth upon the postero-dorsal margin. Dactylos of the second pair of gnathopoda scimitar-shaped.

Length $\frac{5}{20}$ inch.

- Cancer (Gammarus) obtusatus.* MONTAGU, Linn. Trans. vol. xi. p. 5, t. ii. fig. 7.
- Gammarus obtusatus.* LILJEBORG, Ofvers. af kongl. Vet. Akad. Forhandl. 1854, p. 452. BRUZELIUS, Skand. Amph. Gam. p. 55.
- Amphithoë obtusata.* MILNE EDWARDS, Ann. des Sc. Nat. t. xx. p. 377. Hist. des Crust. t. iii. p. 83. WHITE, Cat. Brit. Crust. p. 51. Pop. Hist. Brit. Crust. p. 201. GOSSE, Mar. Zool. i. p. 141.
- Gammarus maculatus.* LILJEBORG, Ofvers. af kongl. Vet. Akad. Forhandl. 1852, p. 10, 1853, p. 138. (Not of Johnston).
- Melita obtusata.* LEACH, MSS. SPENCE BATE, Cat. Amph. Brit. Mus. p. 183, pl. xxxiii. fig. 3.

THE second, third, fourth, and fifth segments of the tail are furnished at the posterior margin, on the back, with a central and two small lateral denticles or tooth-

like processes; these are slightly exaggerated in the above figure. The eyes are small, round, and black. The superior antennæ are about half the length of the animal, and support a short secondary appendage. The inferior antennæ have the peduncle quite equal in length to that of the superior; and the flagellum is about one-third less than the flagellum of the superior. The coxæ of the four anterior pairs of legs are nearly as deep as the respective segments to which they are attached. The first pair of legs have the inferior margins of the metacarpus, wrist, and hand tufted with a short thick fur: the hand is about the same length and about the same breadth as the wrist, it is elongate-ovate, having the palm oblique, imperfectly defined, slightly convex, and armed with short, stiff, equi-distant hairs: the finger is sharp and curved. The second pair of legs have the wrist short, with the inferior angle produced to a point, as is also that of the preceding joint: the hand is large, quadrate, broadest at the palm: the finger, which impinges laterally to the palm into a hollow formed by a lateral denticle and the inferior angle of the palm, resembles, in its form, a Turkish scimitar; the outer margin being somewhat rounded, and the extremity obtuse, a form also peculiar to some other species of this genus. All the other legs are subequal in length; and the three posterior have the thighs with their margins entire. In the few specimens that we have taken of this species the posterior pair of caudal appendages are wanting; but in Montagu's type, in the British Museum, from which our figure was drawn, it does not differ from that of the two following species.

This description is taken from a fresh specimen dredged in Plymouth Sound; the figure, with which we

have since compared it, is from the type preserved in the British Museum.

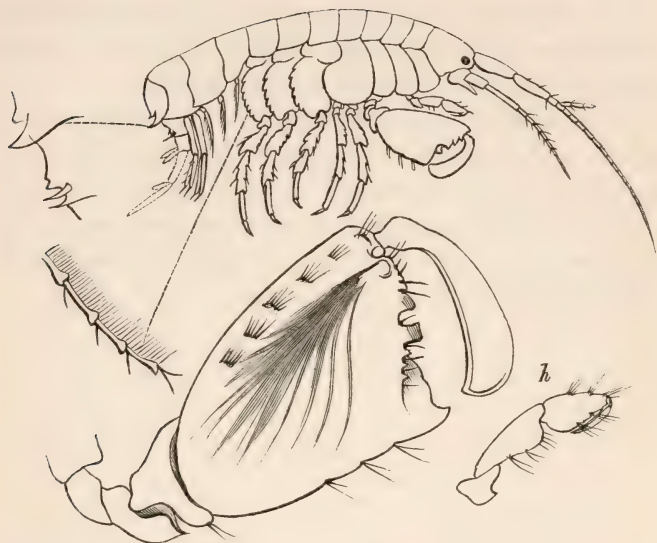
Col. Montagu took his specimen in Salcombe Bay, Devonshire, whilst ours was dredged by us in company with Professor Kinahan in Plymouth Sound.

In the collection of the Paris Museum is a specimen of this species which unfortunately has the habitat not recorded, but we are inclined to think that it is from the coast of Brittany, as in the collection that was kindly intrusted to us for inspection, there were specimens of other Amphipoda from that locality.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



MELITA PROXIMA.

Specific character. Fourth and fifth segments of the pleon having small teeth upon the postero-dorsal margin. Inferior antennæ about half the length of the superior. Dactylos of the second pair of gnathopoda scimitar-shaped.

Length, $\frac{4}{20}$ inch.

Melita proxima. SPENCE BATE, Cat. Amph. Brit. Mus. p. 184, pl. xxxiii. fig. 4.

THE back of this species is quite smooth, except a central rudimentary tooth, and a tolerably prominent one upon each side of the fourth and fifth segments of the tail. The eyes are small and round. The superior antennæ are rather more than half the length of the body, while the inferior pair reach but little beyond the extremity of the peduncle of the superior. The first pair of legs bear a close resemblance to those of

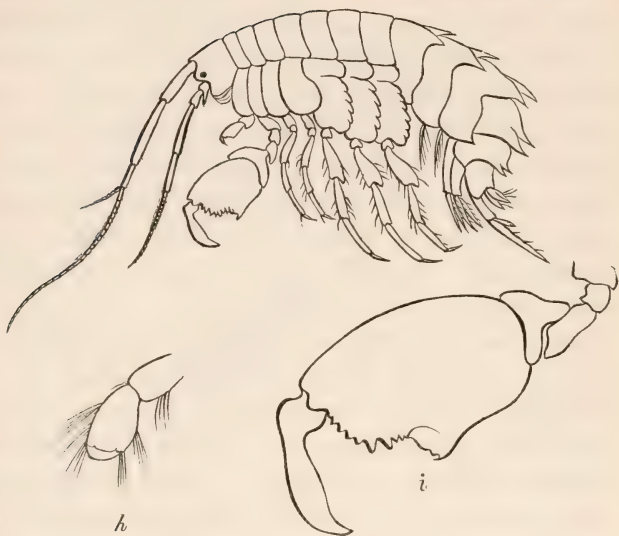
M. obtusata, but they are furnished with a few fasciculi of hairs instead of the short fur upon the inferior margin in that species. The second pair of legs likewise bear a close resemblance to those of the preceding species, but the hand has a more irregularly tuberculated palm: the finger is scimitar-shaped. The three posterior pairs of walking legs have the posterior margins of the thighs serrated; a small hair (microscopic) arising immediately below each little denticle. The posterior pair of caudal appendages are very long; the shorter branch is almost rudimentary.

This species may be readily mistaken for *M. obtusata* (hence the specific name), of which, indeed, we are sometimes inclined to think that it may prove to be a variety: an examination of a greater number of individuals is, however, necessary to determine this point.

Our specimen was taken in Plymouth Sound. We have also received it from our excellent correspondent Mr. Edward, who took it off Banff.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



MELITA GLADIOSA.

Specific character. All the segments of the pleon, except the sixth, having the dorsal surface of the posterior margin furnished with three teeth. Second pair of gnathopoda having the dactylos scimitar-shaped, angulated near its articulation.

Length $\frac{7}{10}$ inch.

Melita gladiosa. SPENCE BATE, Cat. Amph. Brit. Mus. p. 185, pl. xxxiii. fig. 6.

THIS species bears a very general resemblance to the two preceding, but may readily be distinguished by the toothed character of the dorsal surface of the tail, all the segments of which, except the last, have the posterior margin developed into three small teeth. In the specimen from Boulogne, figured in the British Museum Catalogue, there are the rudiments of more teeth on the first and second segments of the tail. The eyes are small and round. The superior pair of antennæ

are about two-thirds of the entire length of the animal; while the inferior pair are not much more than half the length of the superior, and furnished with a flagellum which is scarcely more than half the length of the peduncle. The first pair of legs have the hand small, nearly oval, and furnished with a few fasciculi of hairs. The second pair of legs have the hand very large, broadly ovate; the palm is convex, and unevenly serrated towards the articulation with the finger, and formed into a lateral depression or hollow towards the inferior angle of the palm, into which the finger shuts; the latter is rather angulated near the articulation with the hand, and scimitar-shaped, but terminates in a somewhat sharper point than in *M. obtusata* or *proxima*. The ante and penultimate pairs of pleopoda are short, not reaching quite to the extremity of the peduncle of the last pair, which are very long and very unequal in size.

This species was originally founded upon a specimen taken at Boulogne, preserved in the collection of the Museum of the Jardin des Plantes. A second specimen has, however, been since taken by us in Plymouth Sound.

We have a very strong conviction that this species is identical with *Gammarus podager* of M. Edwards, which is a true *Melita*. The specimen of this latter species, preserved in the Museum at Paris, upon which M. Edwards established the species, is imperfect, but one of its second pair of hands is preserved, and which does not appear to us to be in a normal condition; but since M. Edwards has made it the type of a species, we do not feel warranted, without further observation, to do more than suggest its probable relationship with the present species.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—MCERA.

- Mcera.* LEACH, Edin. Encyc. vii. p. 403. Linn. Trans. xi. p. 359. SAMUELLE, Ent. Comp. p. 103. DESMAREST, Consid. sur Crust. p. 246. SPENCE BATE, Cat. Amph. Brit. Mus. p. 187 (not Dana).
Leptothoë. STIMPSON, Mar. Invert. of Grand Manan, p. 46.
Gammarus (pars). MILNE EDWARDS, Hist. Crust. iii. p. 49.

Generic character. Animal long and slender. Superior antennæ much longer than the inferior, having a secondary appendage. Coxæ not so deep as their respective segments. Second pair of gnathopoda larger than the first. Pereiopoda subequal. Posterior pair of pleopoda biramous. Rami equal. Telson double.

THE species forming this genus are long, and not very robust. The eyes are normal; and the antennæ are long; those of the superior pair have the peduncle considerably longer than the flagellum, while the inferior pair of antennæ seldom exceed the length of the peduncle of the superior. The oral appendages somewhat recede from the facial line; and the mandibles are furnished with a tri-articulate appendage. All the legs have the coxæ less deep than the segments to which they respectively belong. The hands of the first two pairs of legs are subchelate; those of the first pair being small, while those of the second are large. The thighs of the last three pairs are not much dilated. The last pair of caudal appendages are biramous, and the branches are of equal length. The terminal tail-piece is double.

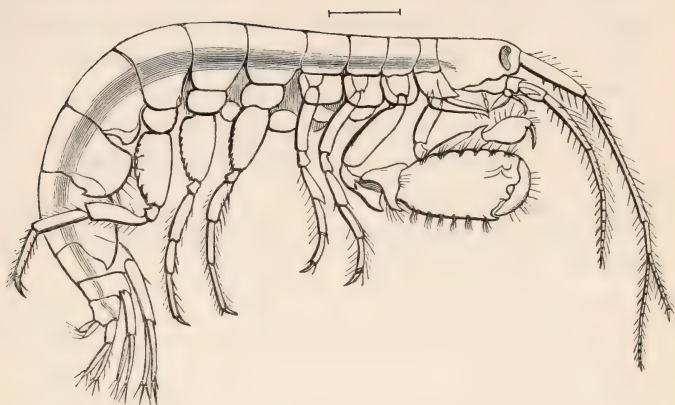
This genus was founded by Dr. Leach to receive Montagu's *Cancer* (*Gammarus*) *grossimanus*; but it was ignored by Milne Edwards and most authors, until Dana reinstated it; unfortunately, however (no doubt from Leach's inadequate description), he attributed the character of this genus to Leach's type of *Melita*, and on the other hand described his genus *Melita* not in accordance with the typical species.

The vignette represents young naturalists in deep research.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



MÆRA GROSSIMANA.

Specific character. Superior antennæ half as long as the animal: peduncle very long, with the second joint longer than the first: the short flagellum not more than half the length of the peduncle: secondary appendage half the length of the flagellum. Second pair of gnathopoda oblong; palm slightly oblique.

Length $\frac{7}{20}$ inch.

Cancer (Gammarus) grossimanus.

Mæra grossimana.

Gammarus grossimanus.

Gammarus Impostii.

MONTAGU, Linn. Trans. ix. t. iv. fig. 5.

LEACH, Edin. Encyc. vii. p. 403. Linn.

Trans. xi. p. 359. Suppl. Enc. Brit. i.

p. 425. SAMOUELLE, Ent. Comp. p. 103.

DESMAREST, Consid. sur Crust. p. 265.

SPENCE BATE, Cat. Amph. Brit. Mus.

p. 188, pl. xxxiv. fig. 3.

MILNE EDWARDS, Hist. des Crust. t. iii.

p. 54. WHITE, Cat. Brit. Mus. Crust.

1847, and Cat. Brit. Crust. 1849,

p. 53. Pop. Hist. Brit. Crust. p. 185.

GOSSE, Man. Mar. Zool. i. p. 141.

SPENCE BATE, Synop. &c. Ann. Nat.

Hist. 2 ser. xix. p. 145.

MILNE EDWARDS, Ann. des Sc. Nat. t. xx.

p. 368. Hist. des Crust. t. iii. p. 49.

IN this animal the head is not deep, but nearly as long as the first three segments of the body. The body itself

is quite as long as the tail, and therefore is half the length of the animal. The eyes are kidney-shaped, and generally black. The superior antennæ are long, being about half the length of the animal, but the peduncle forms at least two-thirds of its length, the secondary appendage consequently appearing to be placed nearer to the distal extremity than is usually the case. The inferior antennæ, likewise, have the peduncle forming a considerable portion of the entire length of the organ, which, however, does not reach beyond the extremity of the peduncle of the superior. The coxæ of all the legs are short, and are but slightly developed in the form of plates, clearly demonstrating the true relation of this joint to the rest of the leg. The first pair of legs are small, and have the hand but slightly dilated: it is oval in form, and has the palm convex and imperfectly defined. The second pair of legs have the hand very large (whence the specific name); the hand is as long as the head and the first two segments of the body, its width being rather more than half its length; the superior and inferior margins are not parallel, and are fringed with fasciculi of hairs; the palm is slightly oblique, and furnished with one or two obtuse teeth, and defined by a small sharp tooth. The walking legs are nearly of the same length; the last three have the thighs but slightly dilated, their posterior margin being serrated. The caudal appendages are long, but the last pair is the shortest, and scarcely reaches beyond the extremity of the preceding pair. The central caudal appendage consists of two ovate plates, with the distal extremity emarginate, the centre of which is armed with a long and a short hair.

When alive the animal is very transparent; its colour being faint yellow, tinted with rose.

Although in the British Museum Catalogue of Amphipoda there are ten species described, yet this is the only one recorded as British. It was first taken by Col. Montagu, on the rocky shores of Devonshire, in pools left by the tide. Dr. Johnston recorded it as not rare in Berwick Bay (Zool. Journ. iii. 180). It has been taken frequently by us in Plymouth Sound; we also found a large number of this species alone amongst the folds of a mass of rope which had been some time in the water, and which was dredged up by our friend Mr. T. P. Smyth. It has been sent to us by our valued correspondent Mr. Loughrin, of Polperro. Mr. Harris has forwarded it to us from Penzance; and we have identified it with Milne Edwards's type of *G. Impostii*, from La Vendee.

It would appear from the circumstance of its being very abundant on the south of England, whilst we have never received it from our numerous correspondents from the north, (although it is recorded by Dr. Johnston at Berwick,) to be essentially a species belonging to warmer latitudes.

It bears a near resemblance to *M. tenella* of Dana from the Fejee Islands.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—EURYSTHEUS.

Eurystheus.

SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58.
Ann. Nat. Hist. 2 ser. xix. p. 143. Cat.
Amph. Crust. Brit. Mus. p. 196. WHITE,
Pop. Hist. Brit. Crust. p. 181.

Gammarus (Division + + *a*). LILJEBORG, Ofvers. af Kongl. Vet. Akad.
Forhandl. 1854, p. 455.

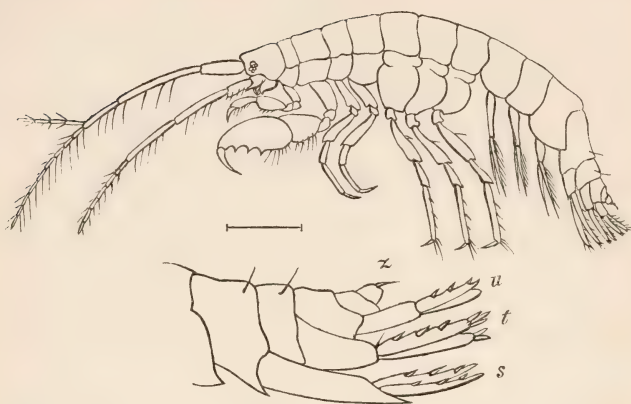
Generic character. Pereion and pleon of equal length. Antennæ subequal, long, and slender; superior pair having a secondary appendage. Gnathopoda subchelate; second pair larger than the first. Posterior pair of pleopoda biramous; rami equal. Telson cylindrical.

THE animals belonging to this genus have the body very long, being quite half the length of the entire animal. The antennæ are long, slender, and sub-equal. The superior are furnished with a secondary appendage. The inferior originate posteriorly to the superior. The mandibles are furnished with an appendage. The first two pairs of legs are subchelate; the second pair are larger than the first, although not of great size. The walking legs are long and slender, increasing in length posteriorly. The caudal appendages are biramous; those of the posterior pair are not foliaceous. The terminal caudal appendage is developed in the form of a small segment, and probably the *primæ viæ* debouches at its extremity.

This genus may be distinguished from *Mæra* by the form of the head and the character of the middle tail-piece.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



EURYSTHEUS ERYTHROPTHALMUS.

Specific character. Second pair of gnathopoda having the palm lunate and armed with three short points.

Length $\frac{1}{4}$ inch.

Gammarus erythropthalmus. LILJEBORG, in Ofvers. af Kongl. Vet. Akad. Forhandl. 1855, p. 124.

Eurystheus erythropthalmus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 196, pl. xxxv. fig. 7.

Eurystheus tridentatus. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xix. p. 143. WHITE, Pop. Hist. Brit. Crust. p. 181.

IN this species the head and body are more than half the entire length of the animal. All the segments are smooth and clean, except the ante- and penultimate segments of the tail, which are laterally furnished with a single hair on each side, springing from a notch or fissure. The eyes are reniform, of a scarlet colour, and situated in the same line with the axis of the superior antennæ, instead of their normal place between the superior and inferior pairs. The superior antennæ

are rather more than half the length of the animal, and are placed at the extreme front of the head; the first joint of the peduncle is as long as the head, and more stout than the second and third, but not quite so long; the flagellum is about half the length of the peduncle; and the secondary appendage is rather more than half that of the primary. The inferior antennæ are a little shorter than the superior; the peduncle reaching nearly as far as the peduncle of the superior. The first pair of legs have the hand small, with the palm oblique. The second pair have the wrist as long as, and continuous* with the hand, the inferior margin of which is furnished with several fasciculi of hairs; the palm is concave, very oblique, and armed with three short points or teeth (that is, two equidistant from each other, and from the third, which defines the limit of the palm). The other legs are nearly of equal length, and are rather long and slender, they increase a little posteriorly, and the last three pairs have the coxæ less deep than the first four; the thighs are much dilated, and the distal extremity of the penultimate joints posteriorly tipped with a small bundle of long hairs. The caudal appendages are uniform, and nearly of the same length, the penultimate pair being rather the shortest; they are biramous, the peduncle carrying at the extremity a strong spine, and the branches having the posterior surface furnished with short stiff spines; the central caudal termination is cylindrical, tipped with a solitary hair.

This interesting form of Amphipod (of which we feel some doubt as to the present being its most natural position, relative to the other animals of the order) has

* By the expression that the wrist is "continuous" with the hand, we mean that the outline of the former is in close continuation with that of the latter, so that they appear as a single joint.

been sent to us by Mr. Gregor, of Macduff, and Mr. Edward, of Banff, as having been taken in the Moray Frith. Mr. Barlee found it at Skye; and we have dredged it off Oxwich Bay, Glamorgan, as well as in Plymouth Sound.

Liljeborg records a specimen from Kullaberg, in Scania, which we consider to be identical with this, hence the reason of our dropping the name which was first given to it in this country in favour of that of Liljeborg, which has a priority of date.

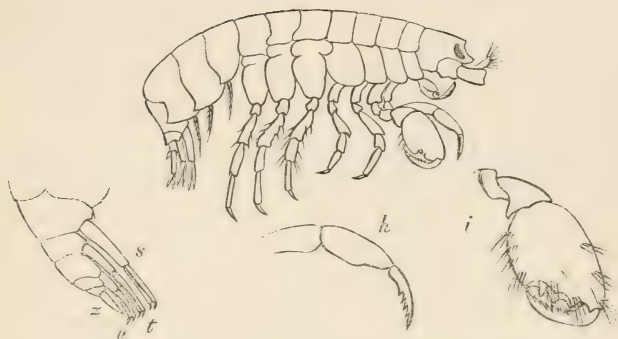
The colour of our specimens, when alive, was pale yellow, with a blush of pink on the anterior half of the body.

The vignette below represents the Shetland fishermen using the bysmar, an ancient form of steelyard still in use. The Haaf or deep sea fishing-boats are in the background.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



EURYSTHEUS BISPINIMANUS.

Specific character. Palm of the second pair of gnathopoda armed with two short stout spines.

Length $\frac{3}{20}$ inch.

Eurystheus bispinimanus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 197, pl. xxxv. fig. 8.

THE animal is a little more robust than the preceding species. The eyes are reniform. Both pairs of antennæ are wanting in our unique specimen; it is therefore not impossible that it may belong to the genus *Nænia*. We, however, retain it in the position originally assigned to it until future observation may enable us to determine its proper genus. The mandibles are furnished with an obtusely-pointed triarticulate appendage. The first pair of legs are long and slender, rather resembling the same appendage in *Nænia* than they do those of the typical species of this genus; they have the wrist as long as the hand, and quite as wide; the hand is not dilated, but tapers gradually from the wrist to the extremity; the palm is not defined, and is so oblique as to be subparallel with the upper margin. The finger

is long, tapering, slightly curved, and deeply serrated upon the inner margin. The second pair of legs have the wrist short; the hand is ovate, having the palm oblique, and about half its length, or about the same length as the inferior margin; it is concave, armed with two obtuse spines, and a short obtuse submarginal tooth. The finger is curved, sharp, and deeply serrated upon the inner margin. The walking legs are nearly of one length. The last pair of caudal appendages scarcely reach beyond the extremity of the preceding pair.

The animal, from which this description and figure are taken, was among the numerous specimens sent to us by our esteemed correspondent Mr. Edward, of Banff.

The following vignette of Taylor's Castle, with Burghead and the Sutors of Cromarty in the distance, was kindly drawn for us by Miss Gordon Cuming, of Altyre.



AMPHIPODA.

GAMMARIDES.

NATATORIA.

Genus—AMATHILLA.

Amathia.* RATHKE, Fauna der Krym. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xix. p. 143. Cat. Amph. Brit. Mus. p. 197. WHITE, Pop. Hist. Brit. Crust. p. 182.

Generic character. Head produced to a short sharp point between the antennæ. Antennæ rather short, subequal in length, the upper appendiculated. Gnathopoda with small subequal propoda. Body and tail carinated; and destitute of spines. Telson entire, slightly emarginate at the tip. Three posterior pairs of pleopoda sub-equal, one of each pair of rami slightly smaller than the other, those of the last pair more foliaceous and equal.

IN all the species of this genus the back is elevated into a carina, which is most strongly developed along the caudal segments. The eyes are normal. The antennæ subequal; the superior pair being furnished with a secondary appendage about one-third of the length of the flagellum, and composed of four oblong articuli, whereas the articuli of the flagellum of all the antennæ are extremely short. The first two pairs of legs are small, subequal, uniform, and subchelate. The walking legs are subequal. The last pair of the caudal appendages terminate in two branches of equal length, and do not extend beyond the branches of the preceding appendages. The central tail-piece is single.

* The name *Amathia* having been long ago proposed by Lamarck for a genus of Polyyps, by Pol. Roux for a genus of Decapod Crabs, and by Duponchel for a genus of Moths, we have, to avoid confusion, slightly altered the name.

This genus was founded by Rathke upon an Amphipod taken at Balaklava, which we have not seen, but which, from his description and figure, agrees so closely with *A. Sabinii* of Leach, that we should certainly have considered them as identical had not Rathke* stated that they were distinct.

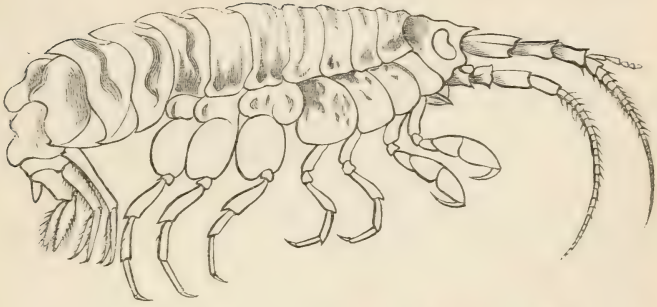
The animals of this genus are essentially Arctic; both the number of species and the size of individuals decreasing as they progress southwards. The Crimean species of Rathke is, however, as large as those of the polar regions.

A specimen labelled *Gammarus dentatus*, in the Museum of the Jardin des Plantes, also so closely resembles Leach's species that we should have associated them had not Pondicherry been recorded as the habitat of the former.

* Nova Acta Acad. Leopold, Nat. Curios. xx. p. 71.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



AMATHILLA SABINI.

Specific character. Dorsum carinated. Three posterior segments of the perion and first two of the pleon produced posteriorly into teeth; the third and fourth posteriorly rounded. Eyes reniform. Gnathopoda uniform; hands small. Rami of the posterior pair of pleopoda subequal, foliaceous, not larger than the preceding rami. Telson lanceolate; truncate at the tip.

Length: male $\frac{3}{4}$ inch, female more than an inch.

Gammarus Sabini.

LEACH, App. Ross's First Voyage, oct. ed. ii. p. 178. SABINE, App. Parry's First Voyage, p. 238, t. i. fig. 8-11. Ross, App. to Parry's Third Voyage, p. 118. Polar Voyage, p. 204. App. Second Voyage N. W. Pass. p. 89. WHITE, Cat. Crust. Brit. Mus. 1847. KROYER, Grönl. Amph. p. 16, t. i. fig. 8-11. Nat. Tidsk. 1 ser. ii. 257. MILNE EDWARDS, Ann. des Sci. Nat. t. xx. p. 368. Hist. des Crust. t. iii. p. 50. STIMPSON, Mar. Invert. Grand Manan, p. 54. LILJEBORG, Ofvers. af Kongl. Vet. Akad. Forhandl. 1851, p. 61, No. 61; 1853, p. 447; 1855, p. 123, No. 14. BELL, App. Belcher's Last Arctic Voyage, p. 404. RATHKE, Fauna Norwegica, Nov. Act. Acad. Leop. xx. p. 71. THOMPSON, Ann. of Philosophy, xiv.

Amathia Sabini.

SPENCE BATE, Cat. Amph. Brit. Mus. p. 197, pl. xxxv. fig. 9.

- Gammarus carinatus*. JOHNSTON, Zool. Journ. iv. 52 (not of Fabricius, Ent. Syst. ii. 515, which = *Atylus carinatus*, Leach).
- Amathia carinata*. WHITE, Hist. Brit. Crust. p. 182. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xix. p. 143. BRUZELIUS, Skand. Amph. Gamm. p. 50 (not Rathke).
- Dexamine? carino-spinosa*. WHITE, Cat. Crust. Brit. Mus. 1847. Cat. Brit. Mus. 1850. Hist. Brit. Crust. p. 178 (but not of Turton, Syst. Nat. iii. p. 760, which is *Atylus carinatus*).
- Amphithoë carino-spinosa*. GOSSE, Mar. Zool. i. p. 141.
- Amathia carino-spinosa*. SPENCE BATE, Cat. Amph. Brit. Mus. p. 199, pl. xxxv. fig. 11.
- Amphithoë Moggridgei*. SPENCE BATE, Ann. Nat. Hist. 2 ser. vii. p. 318, pl. x. fig. 10, 1855. GOSSE, Mar. Zool. i. p. 141.
- Gammarus angulosus*. RATHKE, Nov. Act. Acad. Leop. xx. p. 72, t. iii. fig. 3. LILJEBORG, Ofvers. af Kongl. Vet. Akad. Forhandl. 1851, p. 23, No. 62; 1853, p. 447; 1855, p. 124, No. 15. BRUZELIUS, Skand. Amph. Gamm. p. 50. Frey u. Leuckardt, Beit. z. Kenntn. wirbellos. Thiere, p. 162 (in Bruzelius, l. c.).

THE head is anteriorly produced to a small rostrum. A carina traverses the median line of the back, increasing in height to the penultimate segments of the tail; the three posterior segments of the body, and the first two of the tail, being produced posteriorly into a sharp tooth. There is also a slight carina separating the dorsal from the lateral regions of the animal in the last-mentioned segments. The fourth and fifth segments of the tail have the carina posteriorly terminating in an obtuse edge, the dorsal margin of each being slightly depressed at the centre; the surface of the skin being rather rough, with a row of minute granules on the posterior margin of each segment. The eyes are reniform. The superior antennæ are scarcely half the length of the animal. The flagellum is as long as the peduncle, having the

articuli broader than long; the secondary appendage is slender, and consists of from four to five oblong articuli. The inferior antennæ are slightly longer than the superior; the flagellum being twice as long as the peduncle. The hands of the first two pairs of legs are small, and of the same size and form; they are ovate, and have the palms very oblique and imperfectly defined; and the fingers nearly as long as the hands. The walking legs are nearly of the same length; but the coxæ of the three posterior pairs are shorter than those preceding, and the thighs are broadly developed. The caudal appendages terminate at an uniform extent, and are double-branched, one branch in the first and second pairs being rather more slender than the other, and those of the posterior pair being broader and foliaceous, nearly of the same length and size, and fringed with cilia. The middle tail-scale is entire, flat, elongate-conic, and truncate at its extremity.

The colour of the animal is of a bluish-green, mottled with red.

This species is certainly the *Gammarus* to which Dr. Johnston (without reference to Fabricius) gave the specific name of *G. carinatus*.

It was also referred by Mr. A. White to the *Cancer* (*Gammarus*) *carino-spinosus* of Turton, but it is quite evident that the latter never examined the animal of unknown habitat in the British Museum, which he cites, but that his knowledge was derived from the Fabrician description of *Atylus carinatus*, the name of which he unnecessarily altered. A rigid examination of Arctic as well as British specimens of this species has also satisfied us that the *Amphithoë Moggridgei* is identical with *A. Sabini*.

Rathke has described a species, as distinct from

A. Sabini, under the name of *G. angulosus*, which may, possibly, be a variety of the former. He, however, gives among its specific characters, the rostrum obtuse, the upper antennæ shorter than the lower, the carina wanting in the four basal segments of the tail, the upper surface of the thorax angulated, and the middle tail-scale as broad (oblong-quadrate), and posteriorly sub-emarginate. The majority of these characters would apply to the young of such an animal as *A. Sabini*, whilst the ridge on each side of the dorsal carina, which has been relied upon as the chief distinction between *A. Sabini* and the smaller British specimens (varying from 3 to $4\frac{1}{3}$ lines in length), certainly occurs in the large specimens of *A. Sabini*.

It was first taken by Admiral Ross and General Sabine, in Baffin's Bay. It has been since taken at Godthad, on the coast of Greenland, in about sixty fathoms of water, by Herr Holböll; Mr. Drewsen has captured it at Iceland; Rathke and Dueben have found it in Norway; Liljeborg on the eastern shores of Scandinavia; and Bruzelius says that it is common both in the German and Baltic Seas; the late Dr. Johnston forwarded fine specimens to us from Berwick Bay, where it is not uncommon; and Mr. Byerley took it in the Mersey in 1854; Mr. Barlee has sent it to us from the Shetlands; Mr. Edward from Banff; and Mr. Hodge has taken it at Seaham, on the coast of Northumberland; Mr. Thompson records it as having been taken at Sligo; and Mr. Stimpson states that he found it at Grand Manan, on the coast of the United States.

Of the smaller individuals we have received specimens from the Menai straits, where they were dredged by Mr. Alder; also from Dr. Walker, taken in the Mersey; and recently Professor Kinahan has found it

in the herring nets at Bray on the coast of Ireland; they have been sent to us by Mr. Webster from Tenby and Falmouth: we have taken them on the coast of South Wales; and Mr. Loughrin has sent them us from Polperro. We have, however, failed to detect them among a large number of individuals found at Plymouth. Rathke, Liljeborg, and Bruzelius have obtained them on the eastern shores of Scandinavia.

A. Sabini was originally brought from the Arctic seas by General Sabine, the President of the Royal Society, after whom it was named. The specimens from that locality are more than an inch long, nor are many of those that have been sent to us from the Moray Frith, Berwick Bay, and the coast of Northumberland much smaller.

In colour the smaller animals resemble some of the freshest which we have seen of *A. Sabini*.

It is remarkable that the size of the individual animal decreases in regular proportion as it progresses southwards. In the Shetland and in the Moray Frith it is almost as large as in the arctic regions; at the Menai straits it is scarcely half as large, and on the southern shore of England it reaches its minimum, and as far as we have ascertained, it extends no further southwards. The specimen referred to by Mr. A. White, in the British Museum, from the "Isle of Wight?" is, however, nearly as large as some of the northern specimens.



AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—GAMMARUS.

- Gammarus*. FABRICIUS, Ent. Syst. ii. p. 514. LATREILLE, Hist. Nat. des Crust., &c. vi. p. 315. Gen. Ins. i. p. 58. LEACH, Edin. Encyc. Art. Crustaceology, vii. p. 404. Trans. Linn. Soc. xi. p. 359. LAMARCK, Hist. des Anim. sans Vert. v. 179. DESMAREST, Consid. sur les Crust. p. 265. MILNE EDWARDS, Ann. des Sci. Nat. xx. p. 366. Hist. des Crust. iii. p. 42. (Division 1. A. a.) KROYER, Grön. Amph. p. 27. RATHKE, Fauna der Krym. p. 372. and Nova Acta Leop. 1843. SAMOUELLE, Ent. Comp. p. 103. WHITE, Hist. Brit. Crust. p. 182. GOSSE, Mar. Zool. i. p. 141. LILJEBORG, (Division + 1. b.) Ofvers. af Kongl. Vet. Akad. Forhandl. 1853, p. 446. BRUZELIUS (Division aa — b.), Skand. Amph. Gamm. p. 50. SPENCE BATE, Cat. Amph. Brit. Mus. p. 204.
- Astacus* pars. PENNANT, Brit. Zool. iv. p. 21.

Generic character. Three posterior segments of the pleon furnished with fasciculi of spines on the dorsal surface. Eyes linear or reniform. Antennæ slender, filiform; superior furnished with a secondary appendage. Mandibles having an appendage. Gnathopoda subequal; Propoda not much dilated. Posterior pair of pleopoda biramous. Telson double.

IN this genus the body of the animal is laterally compressed, so much so that the animal has not the power of walking upright when out of the water. The head is not produced into a rostrum; and rarely, if ever, is the back carinated. Each of the last three segments of the tail has one or two small fasciculi of spines. The eyes are linear or reniform. The antennæ are long, slender, and filiform, the superior pair being furnished with a secondary appendage. The mandibles are furnished with a triarticulate appendage. The first two pairs of legs are not much dilated, and have the hands of nearly the same size. The remaining legs are nearly of uniform length; but the coxæ of the last three pairs are very

much smaller than those of the first four. The last pair of caudal appendages are double-branched; and the central tail-plate is double.

We have here restricted the genus to *Gammarus* proper, believing it to be more scientifically correct to group those species as distinct genera which would, in a less-defined description, be arranged in subdivisions as have been done by other authors.

The spines upon the posterior segments of the tail are a constant feature in our British species. In some Arctic forms they are considerably increased, and in *G. verrucosus*, Brandt, they thickly stud the whole of the dorsal surface of the posterior half of the animal.

Species of this genus appear to be abundant in the northern regions, where they attain their largest proportions; but of forty-two species (of which six are given as doubtful in the "Catalogue of Amphipoda of the British Museum"), only two, *G. Verreauxii* (Edwards) and *G. rubromaculatus* (Stimpson), are recorded from the southern hemisphere, and *G. Redmanni* (Leach) from the tropics.

We regard this genus as the type of the *Amphipoda*, and as the *Amphipoda* may in certain respects be considered as the types of the class, it follows that the *Gammari* may be looked upon as typical Crustacea.

As will be observed from the synonymy of the species of this genus very great confusion has been introduced into the nomenclature, especially of the more common species, arising from four different causes: firstly, from the insufficient and inaccurate manner in which distinct species have been described, sometimes arising from a definite expression being misapplied to parts homologically distinct;* secondly, from several species having been

* We have frequently had to remark the repeated application of the same names to express different parts.

confounded together; thirdly, from the misapplication of clear descriptions or figures to different species; and fourthly, from a total disregard of the rules of nomenclature on the part of subsequent writers who have endeavoured to revise the names of these animals.

The genus, even in its restricted state, has need of subdivision with a view to greater facility in the determination of the species, and which has been attempted with greater or less success by various carcinologists.

M. Milne Edwards, in his classical work upon the Crustacea, after the removal of those species which have the eyes of a circular form, divides the species into—A. Those which have the first three segments of the tail straight, and not produced in the middle of the hind margin into a tooth; these are subdivided into, *a*, those with spines on the fourth and fifth segments of the tail (*G. locusta*, *fluvialis*, *marinus*, not of Leach; *Olivii*, *affinis*, &c.): and, *a a*, those which have no spines on the hinder portion of the tail (*G. pulex*, *Ermanni*, *Othonis*, *pinguis*, &c.): whilst the second division, B., comprises those species which have the third, and generally the first and second also, armed with a strong tooth in the middle of the hind margin of each, *G. Sabinii*, *mucronatus*, and *appendiculatus*. According to this arrangement our common fresh-water species, found in rivulets, belongs to the section A. *a.*, but the only fresh-water species which M. Milne Edwards introduces into that section is regarded by him as identical with the insect figured by Roesel, which has a row of strong teeth along the back, and which M. Gervais, who first identified the species, described under the name of *G. Roeselii*. We presume this must be an error on the part of M. Milne Edwards, and are accordingly inclined rather to consider our common English species to be

identical with *G. fluviatilis* of Milne Edwards. That author has, however, described a second French fresh-water species, under the name of *G. pulex*, which he places in his division A. a a., and which he describes as entirely destitute of teeth or spines on the back of the tail. We have seen no species of *Gammarus* agreeing with such a description; it certainly does not agree either with the figures of Geoffroy (who, in fact, copies Roesel's figure of the tooth-backed species), or of Zenker, who as certainly figures our common British species with the first, second, and third segments of the tail, unarmed, and with the fourth, fifth, and sixth furnished with small spines.* The species represented in Roesel's figures (confirmed as they are in the details given by Hosius) and which M. Gervais has named *G. Roeselii*, ought to enter Milne Edwards's section B., but the species of which he has formed that section constitute the several genera *Amathilla*, *Gammaracanthus*, and a doubtful *Gammarus*.

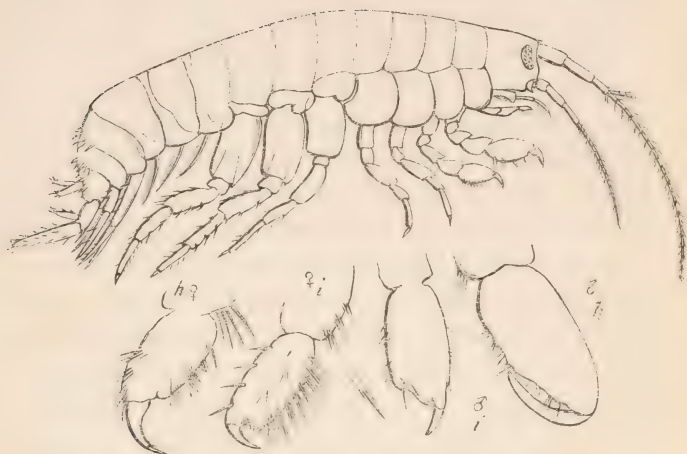
Dr. Leach adopted at different times different characters for the distribution of the species, at one time forming his primary section according to the fresh water or marine habitats of the species, and at another time dividing them according to the rudimental or developed condition of the inner branch of the last pair of appendages of the tail. Without establishing distinct divisions in the genus, we have adopted the latter character as the ground for our arrangement of the species, commencing with those in which the inner branch is almost obsolete, and terminating with those in which it is as large as the other branch.

* Milne Edwards, however, appears to be confirmed in this character by the figure which he has given of *G. Othonis*, which has the tail entirely unarmed with teeth or spines, as well as by Kroyer's description of *G. pinguis*, "dorso lævi per totam longitudinem nullum carinæ, dentium, spinarumve monstrante vestigium."

AMPHIPODA.

GAMMARIDES.

NATATORIA.



GAMMARUS MARINUS.

Specific character. First three segments of the pleon having the postero-inferior angle rounded. Posterior pair of pleopoda having the internal ramus very short.

Length $\frac{1}{2}$ inch.

Gammarus marinus.

LEACH, Linn. Trans. xi. p. 359. Suppl. Encyc. Brit. i. p. 425. SAMOUELLE, Ent. Comp. p. 103. THOMPSON, Ann. Nat. Hist. xx. p. 242. WHITE, Cat. of Brit. Crust. p. 52. Pop. Hist. Brit. Crust. p. 183. DESMAREST, Consid. sur Crust. p. 267. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 215, pl. xxxviii. fig. 4 (not Milne Edwards).

Gammarus Olivii.

MILNE EDWARDS, Ann. des Sc. Nat. t. xx. p. 369, pl. x. fig. 9, 10* (August, 1830). Hist. des Crust. t. iii. p. 47.

Gammarus affinis.

MILNE EDWARDS, Hist. des Crust. t. iii. p. 47, 1840.

* It may be useful to notice that Milne Edwards's references in Hist. Nat. Crust. iii. p. 47, to his figures of *G. Olivii* and *ornatus* are reversed, and that even the references in the Annales, xx. pp. 372, 373, to the details of this species are incorrect.

- Gammarus gracilis.* RATHKE, Fauna der Krym. t. v. fig. 7-10, 1837.
 SPENCE BATE, Rep. Brit. Assoc. 1855. Ann.
 Nat. Hist. 11 ser. xix. p. 144. 1857. WHITE,
 Pop. Hist. Brit. Crust. p. 184.
- Gammarus pæcilurus.* RATHKE, Nov. Act. Acad. Leop. xx. p. 68, t. 4,
 fig. 2. LILJEBORG, Kongl. Vet. Akad. Forhandl.
 1853, p. 450. Ofvers. af Kongl. Vet. Akad.
 Forhandl. 1855, March, No. 16. BRUZELIUS,
 Skand. Amph. Gamm. p. 54.
- Gammarus Kröyeri.* RATHKE, Nov. Act. Acad. Leop. xx. p. 68, t. 4,
 fig. 2. LILJEBORG, Ofvers. af Kongl. Vet. Akad.
 1851, p. 22.

THIS species was first described by Dr. Leach in vol. xi. of the Linnæan Transactions. His specific name has, however, been subsequently misapplied by Milne Edwards to a species which does not exhibit the characters of the terminal appendages as described by Leach, who distinguished this from the common English fresh-water species by having the head between the antennæ subacuminated as well as by the character of the tail appendages above-mentioned.

The first three segments of the tail have the infero-posterior angle not developed to a point; the third, which is generally the most produced, is rounded in this species, a form which is constantly seen to be the case in imperfectly-developed individuals. The fasciculi upon the three posterior segments consist of blunt spines, subapically tipped with a minute cilium, arranged in small bundles of two or three spines each. The eyes are reniform, white, with black spots. The superior antennæ are about half the length of the animal; the flagellum is about twice the length of the peduncle; the secondary appendage consists of but three articuli. The inferior antennæ are about half the length of the superior, and the flagellum is as long as the peduncle. The first pair of legs have the hand but slightly dilated,

the palm is oblique, and not clearly defined. The second pair are about the same size as the first, but the palm of the hand is less oblique and better defined. In the female the hands are rather shorter and more ciliated. Some of the hairs on the wrist of the first pair are fringed with cilia, while those on the wrist of the second pair are three-pointed, those on the hand are subapically furnished with a single cilium. The thighs of the last three pairs of legs are dilated, but the posterior margins are subparallel with the anterior. The last pair of caudal appendages are considerably longer than the two preceding pairs, and have one branch long, and one about one-quarter of the size of the other.* The central tail appendage has each division tipped with a bundle of spines of the same form, with the exception of one, as all the others on the tail; this one is finer, and crowned with a small plumose brush.

The structure of the skin, when viewed under the microscope, exhibits traces of its cellular origin; it is also perforated by numerous round hollows or pores, and a quantity of minute finely-pointed equidistant cilia, arising from bulbs of a somewhat hour-glass form, that is, being larger at each extremity than at the centre, as seen in the annexed figure.



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The colour of the animal is of an olive-green, deepest along the dorsal margin, and verging to a buff at the extremities. Sometimes in a large group, for they are

* Burgersdyck (Annotationes, &c., p. 17) confounds this minute branch with the terminal central bifid tail-piece; and, from want of specimens of the true *G. marinus*, supposes Leach to have erred in his description of the head of the present species.

very gregarious, one or two may be seen entirely of a buff colour.

They live amongst the seaweed, and are commonly found, when the tide is out, to abound far up in estuaries and beneath such of the weed as is below high-water mark, forming a band around the coast-line probably of all southern and western Europe.

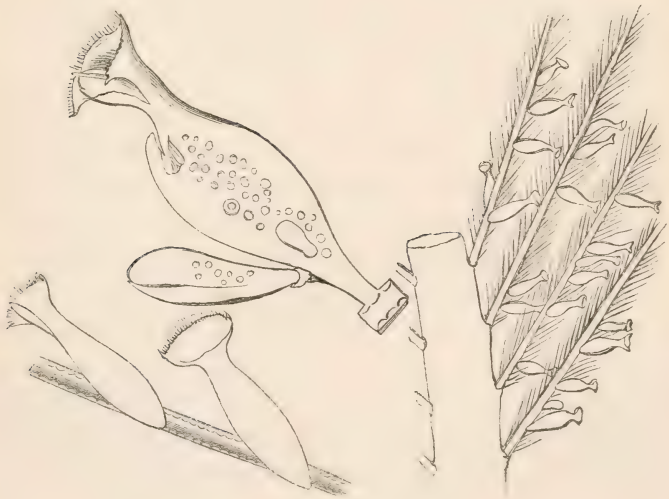
Dr. Leach's specimens of this species in the British Museum are from the coast of south Devon. We have found it very abundantly at Plymouth. Dr. Walker has found it rather common from the mouth of the Mersey to the River Dee. The Rev. Mr. Norman and Mr. Jeffreys have taken it in the Outer Skerries Harbour, Shetlands. Mr. W. Thompson records it from the River Ban, Kilrea, Strangford Lock, Ballysodare, co. Sligo, and Loch Neagh, in Ireland. The specimen described and figured by M. Milne Edwards, under the name of *G. Olivii*, was found by him abundantly on the coast of Naples; and that which he described as *G. affinis*, having the first pair of hands much larger than the second, he took on the coast of La Manche. The specimen that Rathke described under the name of *G. gracilis* he procured abundantly at Cape Parthenon, in the Crimea; whilst *G. Kroyeri* and *pæcilurus* he obtained at Christiansund, Molde, Drontheim, Namoen fiord, and Nitika; and Liljeborg has procured it on the eastern coast of Sweden. We can discover no character sufficient to distinguish these from Leach's specimens.

The figure given by Rathke of *G. pæcilurus* has the palm of the hands drawn as serrated, which is not the case in *G. Kroyeri*. This character is not noticed in the author's description, and both Liljeborg and Bruzelius consider the two to be one and the same species.

As soon as they are placed in a tank the animals of this species invariably dive to the bottom, and bury themselves beneath the stones; but should a piece of cork be placed upon the water, the animals will invariably return and crowd the under surface of the float.

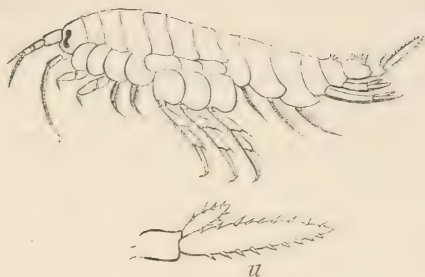
But although they may like the surface of the water their constant habitat is amongst the dark fuci which grow with such fertility between the tide-marks. Their habits are probably not so active as those of other species, since we find that their natatory appendages are often thickly covered with a species of *Vaginicola*, which Mr. Tuffen West considers may probably be *V. crystallina*. The following vignette illustrates this parasite. It is figured by M. Rentsch* as a species of *Gregarina* in his work on the Parasites of *Gammarus ornatus*.

* Homoiogenesis. Erstes Heft. *Gammarus ornatus* und seine Schmarotzer. Wismar, 1860, 4to.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



GAMMARUS CAMPYLOPS.

Specific character. Third segment of the pleon having the infero-posterior angle produced to a point. Posterior pair of pleopoda having the inner ramus nearly half the length of the outer. Eyes sigmoid or reniform.

Length $\frac{1}{2}$ inch.

Gammarus campylops.

LEACH, Edin. Encyc. vii. p. 403.

Gammarus campylops.

LEACH, Linn. Trans. xi. p. 360. Suppl. Enc. Brit. i. p. 425. DESMAREST, Consid. sur les Crust. p. 267. MILNE EDWARDS, Hist. des Crust. iii. p. 48. THOMPSON, Ann. Nat. Hist. t. xx. p. 242.

Gammarus camptolops.

SAMOUELLE, Ent. U. Comp. p. 104. WHITE, Hist. Brit. Crust. p. 183. Cat. Brit. Crust. p. 53. Cat. Crust. Brit. Mus. 1847, p. 88. Cat. Brit. Crust. Brit. Mus. 1849. GOSSE, Mar. Zool. i. p. 147. SPENCE BATE, Cat. Amph. Brit. Mus. p. 209, pl. xxxvii. fig. 3.

Gammarus campylops.

MILNE EDWARDS, Ann. Sc. Nat. xx. p. 367.

Gammarus locusta.

LILJEBORG, Ofvers. af Kongl. Vet. Akad. Forhandl. 1853, p. 448.

THIS species differs from *G. locusta* in the following characters. The eyes are linear, reniform, or occasionally bent in the form of the letter S. The antennæ are short. The superior pair in the type specimen do not reach beyond the third segment of the body, and the

flagellum is not longer than the peduncle ; the secondary appendage is also short. The inferior pair are somewhat longer than the superior, a circumstance that induces us to believe that the latter have been shortened by accident, since they are longer in the specimens which we have considered to belong to this species, and also generally in the genus ; in fact, we only know of two species, *G. Caspius* and *G. Atchensis*, of Brandt, that have the superior antennæ shorter than the inferior. The hands are nearly of one size and ovate. The second and third segments of the tail are infero-posteriorly produced to a point. The posterior pair of caudal appendages reach much beyond the preceding two. The branches are unequal, the inner being about half the length of the outer, and both are fringed with short obtusely-pointed spines. The central tail-piece is double.

We have taken our description and figure from one of the specimens preserved in the British Museum, which are those from which Dr. Leach originally defined the species, and which were found by him in the sea near Loch Ranza in the Isle of Arran. Our friend, the late Mr. Barlee, sent us some from the Shetlands. And it appears to us that the sigmoid form of eye is not to be depended upon, for many of the specimens differ in no respect from the others except in the crooked eyes. The probability therefore is, that the crooked eye is an abnormal form, and not the true condition of the organ.

Thompson, in his Natural History of Belfast, states that it has been found by Mr. Hyndman and himself, at Belfast, in the tidal river Lagan above the bridge at high water.

This species appears to be a form intermediate be-

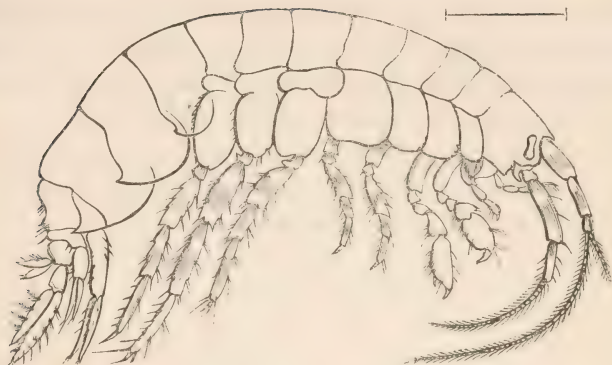
tween *G. marinus* and *G. locusta*, and as such we consider it to be one which we have observed also on the Devonshire coast. We can perceive no distinction, except in the form of the eyes, between the description of this species and that of *G. locusta* of Liljeborg, and we have therefore considered them to be identical.

The following vignette exhibits a Gammarus in the act of shedding its skin, a full account of which process will be given in the Introduction.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



GAMMARUS LOCUSTA.

Specific character. Eyes reniform. Superior antennæ longer than the inferior. Posterior pair of pleopoda having the rami subequal. A red spot on the second, third, and fourth segments of the body, on the coxæ of the last three pairs of pereiopoda, and on the three anterior segments of the pleon, each of which has the postero-inferior angle produced to a point.

Length $\frac{3}{4}$ of an inch.

Cancer macrurus thorace articulato cæruleus. LINNÆUS, Gothl. Reza, p. 260.

Cancer locusta. LINNÆUS, Faun. Suec. 2nd ed. p. 497. Sys. Nat. p. 1055.

Cancer (Gammarus) locusta. MONTAGU, Trans. Linn. Soc. ix. p. 92, t. iv. fig. 1; xi. p. 359.

Gammarus locusta. FABRICIUS, Ent. Syst. ii. p. 517. LEACH, Edin. Encyc. Art. Crust. vii. p. 403. Trans. Linn. Soc. xi. p. 359. Suppl. Enc. Brit. i. 425. SAMOUELLE, Ent. Comp. p. 104. DESMAREST, Consid. sur Crust. p. 267. MILNE EDWARDS, Ann. des Sci. Nat. t. xx. p. 369. Hist. des Crust. t. iii. p. 44. KRÖYER, Grön. Amph. p. 27. RATHKE, Fauna. der Krym. p. 372, pl. v. fig. 11-14. WHITE, Hist. Brit. Crust. p. 182. Cat. Brit. Crust. in Brit. Mus. p. 51. Cat. Crust. in Brit. Mus. p. 87. GUÉRIN, Icon. R. An. Crust. pl. xxvi. fig. 6. GOSSE, Mar. Zool. i. pp. 141, 257. SPENCE BATE, Ann. Nat.

- Hist. 2 ser. xix. p. 144. Cat. Amph. Brit. Mus. p. 266, pl. xxxvi. fig. 6 ZADDACH, Syn. Crust. Pruss. Prod. p. 4. LILJEBORG, Kongl. Vet. Akad. Handl. 1853, p. 448. Ofvers. af Kongl. Vet. Akad. Forhandl. 1852, p. 9. BURGERSDYCK, Annot. de qu'il Crust. p. 18. BRUZELIUS, Skand. Amph. Gamm. p. 52. VAN BENEDEN, Recherches sur la Faune lit. de Belgique. Crustacés, p. 144.
- Gammarus Duebenii.* LILJEBORG, Ofvers. af Kongl. Vet. Akad. Forhandl. 1851, p. 22.
- Gammarus mutatus.* LILJEBORG, Kongl. Vetensk. Akad. Handl. 1853, p. 448.

IN this species the three anterior segments of the tail have the infero-posterior angle produced to a point. The eyes are of a long reniform shape, and are white in colour. The antennæ have the peduncles strongly hirsute. The superior antennæ are nearly half the length of the animal, and terminate in a very slender flagellum; the secondary appendage is about one-third the length of the primary; in full-grown specimens it consists of nine, but in younger individuals of only four or five articuli. The inferior antennæ are rather more robust than the superior, and about one-fourth shorter; the flagellum has but few articuli. The hands are small, nearly of one size, and furnished with several fasciculi of hairs; the palm of the second pair is more oblique than the first. The first two pairs of walking legs are short, the last three are unequal in size, the middle being the longest. The first three segments of the tail have the posterior margin unarmed, whilst the last three are respectively furnished with three fasciculi of spines, the lateral ones having about six spines in each. The last pair of caudal appendages have the branches subfoliaceous, and nearly of one length, the inner one sometimes one-fourth or one-third smaller than the outer one; both are fringed with bundles of

hairs, but on the inner branch, besides the short stiff hairs, a solitary long plumose cilium is attached to each fasciculus of hairs.

The colour of the animal is a bluish-green, mottled with darker spots of the same, and on the sides, being permanent in position and constant in appearance, are several bright red or scarlet spots. These are not in the skin, but appear to consist of fat globules more deeply seated. One is situated near the infero-posterior angle of the second, third, and fourth segments of the body; a small one also exists in the posterior lobe of the coxæ of the three last pairs of legs, and another near the posterior margin of the three anterior segments of the tail. In the living animal they afford a convenient, and, as far as our experience goes, a certain specific guide.

Under the microscope the skin is seen to have a granulated structure, while certain arrow-headed spines appear as piercing through some more transparent spots. Upon the anterior segments of the tail is a curved row of minute cilia, each surrounded by a ring, the whole enclosed by a clear areola.



Dr. Leach, in the *Edinburgh Encyclopædia*, states that the females carry their young about with them, after their exclusion. This circumstance has frequently been verified; but upon the authority of our valued correspondent, Dr. James Salter, we are enabled to communicate one of the most interesting instances of maternal solicitude yet recorded amongst animals so low in the scale of physical arrangement.

Dr. Salter says, "On catching a female with live larvæ nothing is seen of the progeny till the parent has become at home in the aquarium, when the little creatures leave her and swim about in her immediate neighbourhood.

The plan I have adopted to watch this curious habit of maternal protection has been to place a single individual in a bottle of sea water. After a time, and that soon, the little crustacean seems at ease and swims slowly about, when the young fry leave her and swarm around her in a perfect cloud; they never leave her for more than half or three-quarters of an inch, and as she slowly moves about they accompany her. If now one taps the side of the bottle with one's finger nail, the swarm of larvæ rush under their parent, and in a second are out of sight. The parent now becomes excited and swims about quickly as if trying to escape; but by letting the bottle containing her rest quite still on a table she soon gets composed, when out come the young larvæ again and swim about as before. This may be repeated as often as the observer wishes, and always with the same result. I have only seen this in one species, but it is quite a common species in Poole Harbour, and I have watched the interesting habit many times."

Our vignette represents this instance of parental instinct; but our correspondent has informed us that our drawing is wrong in exhibiting the mother as swimming fast, and being followed by her brood. The parent swims about slowly, while the young ones surround her on every side. In a little while they increase in size, and as they grow older they obtain more confidence, and quitting, forget the anxious care that guarded them in their early hours.

This species appears to be pretty generally diffused all round Europe, and may be found in pools near low water, and in the sea near the margin; though frequently associated with, it appears generally to inhabit the sea at a short distance further from the shore than,

G. marinus. Montagu states that it never quits the water by choice, is incapable of leaping, and seems to make very little use of its legs out of that element, for when deprived of water it lies on its side and endeavours to force itself along by the action of the tail. It is stated that if put into fresh water it soon dies.*

It has been taken by Rathke in the Crimea, and by Liljeborg on the coast of Sweden; but if we are to judge of its normal habitat by the magnitude to which it attains, the shores of the Arctic seas are where it flourishes most. Some specimens in the British Museum, procured by Mr. Drewsen at Iceland, are one inch and a half long, while the largest that we have seen as British has not attained a greater length than three-fourths of an inch. Dr. Walker, the naturalist to the last Arctic expedition, under Sir F. L. McClintock, informs us that the Arctic specimens frequently exceed two inches and a half in length, and are phosphorescent. This phosphorescent character has been affirmed of other species, and is probably to be attributed to the food eaten by the animal at the time, and is not a permanent condition.

Having already (*antè*, p. 15) employed the Linnæan specific name, *Locusta*, instead of that of *Saltator*, for our English species of *Talitrus*, and given in the preceding page a history of this name, the strict rules of nomenclature forbid its second adoption for another species with which Linnæus may have happened to have confounded it, and which, in the case of the present species, is also inapplicable, the animal neither

* Mr. Robertson informs us that he has found that five out of seven, after being eighteen hours in fresh (rain) water, continued to live upon being returned to salt water.

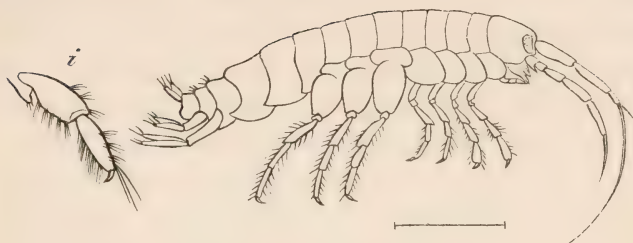
possessing the powers of leaping, nor having a large produced head resembling that of a locust. At the same time, as we believe that Linnæus had the animals of the present species (generally distinguished by their bluish-green colour) more especially in view in his various notices both of *G. locusta* and *pulex*, and as almost all modern carcinologists are agreed in giving the name of *Locusta* to the present species, we shall pursue the same nomenclature, reiterating our opinion that it would have been simpler to have adopted the name of *Saltator* for *Talitrus locusta*, and expressing our regret that Montagu, who appears first to have clearly defined the present species,* did not give it a distinct specific name, as has indeed been done by Liljeborg, who, however, subsequently sunk the name *G. Duebenii* into that of *G. locusta*.

* It must be noticed that Montagu represents the superior antennæ as considerably shorter than the inferior; this probably arose from his figure having been drawn from an injured specimen, as he represents the relative size of the joints of the peduncles of both antennæ correctly.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



GAMMARUS TENUIMANUS.

Specific character. Flagellum of inferior antennæ very short. Gnathopoda having the propoda more slender than the carpi.

Length $\frac{12}{30}$ inch.

Gammarus tenuimanus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 214, pl. xxxviii. fig. 2.

THIS species very closely resembles *G. locusta*, but differs from it in having the flagellum of the inferior antennæ shorter than the peduncle, and in the hands on the first two pairs of legs being very slender. The first two pairs of legs are of the same size, and have the wrists as long as the hands, but wider; the hands are long, ovate, and have no defined palms; the fingers, which are very short, close upon the inferior margin. Both the wrists and hands have the margins furnished with bundles of tolerably long hairs. The posterior pair of pleopoda are, unfortunately, absent from the only specimen that we have seen.

The shortness of the flagellum of the inferior antennæ, and the slenderness of the first two pairs of legs suggest the possibility that the specimen upon which the species is established may have been injured, and have had these organs reproduced of a diminished size. As

instances of such want of development or reproduction, we may mention that we possess a specimen of *G. marinus* in which one of the superior antennæ is only half the length of the other; and a specimen of *G. locusta*, in which one pair of the branches of the sixth segment of the tail is only half the size of the opposite pair on the same joint.

We found this species amongst many specimens that were sent to us by the Rev. Geo. Gordon, from the mouth of the rivers Ness and Brauley, N.B. We assume that the water must be brackish, inasmuch as they were forwarded for the purpose of defining the limits of the estuary by an examination whether the Crustacea found therein belonged to fresh or salt water.

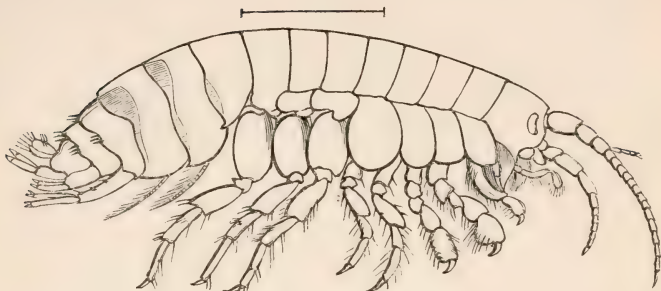
The following pretty sketch of Burghead, on the Moray Frith, was kindly drawn for us by Mr. Small.



BURGHEAD.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



GAMMARUS EDWARDSII.

Specific character. Like *G. locusta*, but more robust. Gnathopoda having the pleopoda truncate. Posterior pair of pleopoda short; having the rami equal, and not longer than the peduncle.

Length, $\frac{3}{4}$ inch.

- Gammarus marinus.* MILNE EDWARDS, Hist. des Crust. iii. p. 46 (not Leach.) WHITE, Hist. Brit. Crust. p. 188. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 144.
- Gammarus Edwardsii.* SPENCE BATE, Cat. Amph. Brit. Mus. p. 208, pl. xxxvii. fig. 2.

THIS species resembles *G. locusta* in its general aspect, but may be readily distinguished from it by the more robust appearance of the animal and the shortness of the antennæ. The upper pair are about a third of the length of the animal; the flagellum is longer than the peduncle, and the secondary appendage has only three articuli.* The inferior antennæ are shorter than the superior. The hands of the first pair of legs are broadly ovate, having the palm scarcely oblique. The second pair of legs have the hands longer, and slightly narrower than

* It is proper to observe that, whilst M. Milne Edwards states that the last pair of abdominal appendages scarcely extend beyond the preceding pair, he expressly says that the accessory appendage of the antennæ is longer than in *G. locusta*.

those of the first pair; the palm is straight and defined by a slightly-produced point. The posterior pair of caudal appendages are short; the branches, which are equal in length and subfoliaceous, are not longer than the peduncle.

Two specimens of this species were found by us in a pool at Starcross, Devonshire, into which the tide formerly flowed, but which has been cut off by the railway embankment, so that we are not aware that the sea has entered it for many years, while a small fresh-water stream constantly runs into it.

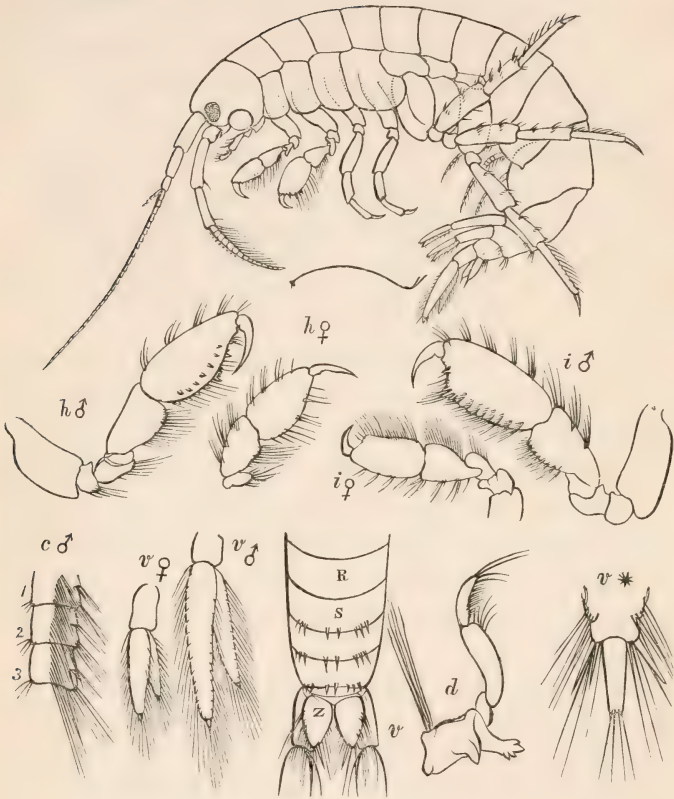
The animal was considered by us to be identical with M. Edwards's description of *G. marinus*, and it was named accordingly, until we discovered that Leach's type-specimens and description did not agree with those of Edwards. We therefore abandoned the name belonging to another species; but being desirous of associating with the discovery one who has done so much for Carcinology, we have attached to the species the name of Prof. Milne Edwards.

The colour of the specimens which we procured was of a ferruginous red—a circumstance that in some measure may be due to the soil, the whole of which is very red, belonging, as it does, to the New Red Sandstone. We presume from their general aspect that they are females, and that the males will be of a slenderer form, with longer limbs.

The specimen which M. Milne Edwards originally described, and which he considered might probably be only a variety of *G. locusta*, was taken on the coast of France.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



GAMMARUS PULEX.

Specific character. Very much like *G. locusta*. A few slender cilia mixed with the spines on the dorsal surface of the fourth and fifth segments of the pleon. Eyes reniform, formed of minute black dots. Secondary appendage of the superior antennæ slender, rather short, 3-4 jointed. Posterior pair of pleopoda much longer than the preceding pair; having the rami subequal, subfoliaceous, and with the margin ciliated. Upper antennæ rather longer than the inferior; peduncle of the inferior much longer than that of the superior.

Length of male $\frac{1}{10}$ inch.

Cancer pulex.

LINNÆUS, Syst. Nat. 1055? Krebsformiger Wassermurm, FRISCH, Ins. vii. p. 26, fig. 18.

Squilla pulex.

DE GEER, Mémoires, vii. p. 525, t. 33 (certe).

Astacus pulex.

PENNANT, Brit. Zool. iv. 21.

- Gammarus pulex.* DESMAREST, Cons. Crust. p. 266, tab. 45, fig. 8.
ZENKER, Comment. de Gamm. pul. fig. A c and details. GERVAIS, Ann. Sci. Nat. 2 ser. iv. p. 128. HOSTIUS, Dissert. de Gammari spec. p. 19; and in Wieg. Archiv. 1850. i. p. 233.
BURGERSDYK, Annot. de Crust. indig. p. 4.
MILNE EDWARDS, in Cuvier, Règne An. edit. Crochard, pl. 60, fig. 1. MILNE EDWARDS, Hist. Nat. Crust. t. iii. p. 48?? LATREILLE, Hist. Nat. Ins. &c. vi. p. 316? Gen. Crust. Ins. i. p. 58? LEACH, Edin. Ency. vii. p. 402, 432 (not of Fabricius). BRUZELIUS, Skand. Amph. Gam. p. 54. LILJEBORG, Kongl. Vetensk. Akad. Handl. 1853, p. 449.
- Gammarus aquaticus.* LEACH, Linn. Trans. xi. p. 359. Suppl. Encyc. Brit. i. p. 425. SAMOUELLE, Ent. Comp. p. 103.
- Gammarus Fossarum.* KOCH, Deutschl. Crust. Myr. u. Arach. h. 5, No. 1; and Panz. Ins. Germ. Suppl. h. 138, No. 1.
- Crerette des ruisseaux.* GEOFFROY, Hist. des Ins. ii. p. 667, pl. xxi. fig. 6?
- Gammarus fluvialilis.* MILNE EDWARDS, Ann. Sci. Nat. t. xx. p. 368.
ZADDACH, Prodr. Syn. Crust. Pruss. p. 6 (not of Ray nor Rösel).

THE present species bears so near a resemblance to *G. locusta*, in everything except colour and habitat, that it requires the closest observation to distinguish the two species. In all the marine species the fasciculi of spines upon the dorsal surface of the caudal segments are short and stiff, whilst in this fresh-water species they are mixed with others of a more slender hair-like character. The eyes also are formed of minute black dots, and rounder, though still reniform. The superior antennæ have the peduncle extending only to the extremity of the penultimate joint of the peduncle of the lower pair; the secondary appendage is very slender, shorter than in *G. locusta*, and composed of only three or four articuli. The inferior antennæ are rather shorter than the superior, they have the olfactory organ largely developed, and the flagellum in the male is very robust. The first two pairs of legs are subequal; the hands are nearly of the same size, but the second pair have the palm less

oblique than the first. The walking legs are subequal; the posterior pair of caudal appendages are much larger in the male than in the female, and have the inner branches one-fourth or one-third shorter than the outer; their margins are ciliated, and each branch terminates in a minute but distinct joint.

The females in this species are invariably one-third, or even one-half, smaller than the males, their limbs are also shorter and more slender, and the branches of the sixth pair of caudal appendages are scarcely half the length of those of the male.

The colour of this species is of yellowish brown, varying in depth according to the soil over which the streams flow in which they dwell.

We have found these animals in almost every stream that we have looked for them; they are most common in shallow overgrown ditches. Sometimes, as in a field in Carmarthenshire, they are so abundant that a single dip of the sieve would bring up perhaps a hundred specimens, but in Devonshire our experience is, that they are not only less abundant but also upon the whole smaller.

The close resemblance of the fresh-water species with others that exist in the sea is very curious, the more so since the inhabitants of either will die if transferred from one to the other. And yet we have seen marine crustacea thrive in fresh-water ditches, that were rendered brackish by the sea breaking into them only once or twice in a year.

It may be something more than a coincidence that gives to each of our fresh-water forms a representative species in the ocean; the key to which may be suggested by the interesting discoveries of Cederström, Olofson, and Widigren, in the lakes of Vetter and Vener, in the south of Sweden, of which an account has been

published by Lovèn.* These two inland fresh-water lakes are situated on high ground, and have the surface of their waters three hundred feet above the level of the Baltic, whereas the bottom is one hundred and twenty feet below such level. In these lakes (which appear to have been lifted up with the gradual uprising of the country) have been found several genera and species of crustacea, three of which are AMPHIPODA, which are affirmed to be identical with marine ones, namely, *Gammaracanthus loricatus* (Sabine, Ross, Kröyer), *Pontoporeia affinis* (Lindström),† and *Gammarus cancelloides* (Gerstfeldt)‡. The first is now only known to exist in the Arctic seas, the second in the Baltic, and the last was found in Lake Baikal, in Central Asia. It is therefore suggested by Lovèn that when the land was raised so as to convert these waters from marine bays into inland lakes, these marine species were retained within the basins, the waters of which have since been changed, through the agency of springs, into fresh-water; and with the gradual transfer of the water the habits of the animals have also changed gradually, and that without any outward alteration of form. Prof. Lovèn thinks that there is sufficient evidence to show that this change in the conditions of these lakes must have taken place during the great glacial period, at a time when the

* Ofvers. af Kongl. Vet. Akad. 1861, No. 6.

† Ofvers. af Kongl. Vet. Akad. Forhandl. 1855, p. 63.

‡ Gerstfeldt, Mem. de l'Acad. de St. Petersbourg, viii. pp. 287-8, ix. tab. fig. 8.

Through the kindness of Professor Kinahan, who received them from Prof. Lovèn, we have had an opportunity of examining specimens of these three amphipoda, and, certainly, except in their being of smaller dimensions, we can perceive no distinction between them and the marine specimens. With the Siberian *G. cancelloides*, Gerstfeldt, we are not acquainted, but observe that the specimen from Sweden is not a *Gammarus*, and that it bears no very distant resemblance to *Pallasea cancellus* (Pallas). Besides the above, the following marine crustacea have been taken in these fresh-water lakes, *Mysis relicta*, N.S., and *Idothea entomon*, L.

animals now found in it, (and which are known at this day only to inhabit the extreme north), could have lived in the same latitude as the south of Sweden. The evidence of these fresh-water lakes suggests that similar changes in the relative position of sea and land may have been the cause of our having fresh-water crustacea nearly allied to marine species in our rivers and inland streams. A fact, however, recorded by Hosius with regard to the habitats of the three fresh-water species of western Germany would seem to discountenance the idea that these animals can adapt themselves to any great change of situation. “Inter loca, quæ habitant, multum interesse mihi videtur; *G. puteanus* [*Niphargus p.*] tantum in puteo, *G. pulex* non nisi in rivis rapide profluentibus atque minime profundis, *G. fluviatilis* [Rösel’s species] in aquis solum stagnantibus aut lente manantibus ac profundis versatur. Nunquam hæ ultimæ species una mihi occurrerunt, *nec si aquæ, in quibus commorantur, inter se conjunctæ erant*. Dum enim, ut exemplum afferam, in piscina *Poppelsdorffiana* *G. fluviatilis* solus reperitur, in rivo, qui e montibus hanc in piscinam effunditur, solus *G. pulex* versatur. Idem quoque mihi aquas prope Godesbergam perscrutato, probabile videbatur, ubi rivus, qui a Marienforst in planitiem defertur, tantum *G. pulicem* colit, dum in stagnis cum rivo cohærentibus solus *G. fluviatilis* versatur.”—*Dissert. de Gammaris Spec.* p. 18.

Taking this statement of the diversity in the habitats of the two species of *Gammarus*, as here restricted, into consideration, we anticipate that Rösel’s tooth-backed species will yet be found in some of our ponds and stagnant waters, although it has not hitherto been detected. We are also hence enabled to identify the descriptions of various writers, from the habitat in which the specimens were found; thus, where Latreille says that his *Gammarus pulex* is found, “dans l’eaux

douces des ruisseaux et des fontaines ;” or where Geoffroy says of his species that it is “trouvé communement dans l’eau courante des petits ruisseaux,” we are convinced that each alludes to the species of De Geer, found only in running rivulets, although both have copied Rösel’s figure of the tooth-backed species found only in still and stagnant water.

The earliest notice we meet with of a species named *G. fluviatilis* occurs in Ray’s work on Insects, p. 44, where he loosely describes an insect under the name of *Pulex fluviatilis*, found “in aquis calidis in specu Custozæ prope Vincentiam, in Italia, ubi nulla animalia vivunt.” This animal was probably a species of *Niphargus*, but Ray added a few words to his description, which might thence also be supposed to include our fresh-water species, “quæ in nostris rivulis sunt non saltant ut marinæ sed incurvant se et natant podicem exerendo satis celeriter.” We next find Linnæus in his *Iter Æland.*, pp. 42, 96, speaking of “*Cancer Pulex fluviatilis* dictus, Suecis Marta, Scanis *Sandhare*. Habitat ad littora maris vulgatissimus, frequens rodens retia, conficiens sceleta piscium, natat in dorso,” characters and names which evidently apply only to our *Gammarus locusta*. We next find Rösel employing the term *Astacus fluviatilis* in a generic sense* for several distinct kinds of long-tailed crustacea, of which he gives excellent figures, namely, the cray-fish, the shrimp, and a fresh-water species of *Gammarus*, for which the specific name has been subsequently retained, and which is distinguished at once by having the middle of the hind margin of each of the segments of the tail armed with a strong tooth. This has been named *G. Röselii* by

* Just as he employs the term “*Cimex aquaticus*” for the general heading of the plates of all the species of Water Hemiptera which he figures, including at least six modern genera.

Gervais, who first clearly pointed out the distinction between it and De Geer's smooth-tailed species, for which he retained the name of *G. pulex*. As already stated, we fear that M. Milne Edwards has fallen into some confusion in treating upon these fresh-water species. He placed one, to which he applied the name of *G. fluviatilis*, in his section without teeth on the anterior, but with small spines on the posterior segments of the tail; but he refers his species not only to De Geer, whose figures perfectly agree with this sectional character, but also to Rösel, Geoffroy (whose pl. xxi. fig. 6, is copied from Rösel), and to Gervais, all of whom as certainly intend a tooth-backed species. To add to the confusion, M. Milne Edwards expressly says that the penultimate joint of the peduncle of the superior antennæ reaches the tip of the peduncle of the lower ones; and adds, under *G. marinus*, that the sixth pair of caudal appendages scarcely extend beyond the extremity of the preceding pair of the same organs. The other fresh-water species of M. Milne Edwards is still more unintelligible; this he names *G. pulex*, placing it in the section which has no teeth on the first three segments, and no spines on the posterior segments of the tail, and giving as its references, Geoffroy, Linnæus (?), Fabricius, and Latreille, all doubtful, as well as Montagu, Desmarest, Zenker, and Gervais, whose species has spines on the terminal segments of the tail.

We have stated above that Linnæus employed the name *Pulex aquaticus* in the *Fauna Suecica* exclusively for a marine or littoral species, but in his *Systema Naturæ* he says: "Habitat ad maris littora, etiam in fontibus et fossis," thus confounding a sea and a fresh-water species together; but we have not the slightest means of knowing to what fresh-water species he alluded. Fabricius, on the other hand, although he quotes De Geer's figures

of the toothless-backed fresh-water species, under *G. pulex*, had evidently in view a littoral species: "Habitat in maris littora frequentissimus saliens, retia destruens, piscibus infestans, in brachiis ulcera caussans." These interesting peculiarities of habit are not in the slightest degree attributable to our fresh-water species; on the other hand, the *G. locusta* of Fabricius evidently comprised both a littoral and fresh-water species, "etiam sæpe in fontibus et fossis stagnantibus." The *G. pulex* of Latreille, Hist. Nat. Insectes, &c., vol. vi. p. 316, is a fresh-water species, the description of it is not, however, precise enough for discrimination; the habitat indicates a species found in running streams, but the figure (pl. lvii. fig. 1) is copied from Rösels figure of the tooth-backed species.

There is, however, fortunately, no confusion in the descriptions and figures of De Geer, Zenker, Burgersdijk, Hosius, Gervais, Koch, and Zaddach; and in employing the name of *Pulex* for the present species, as used by De Geer and subsequent authors, we are adopting the strict rules of nomenclature, as well as employing a term which recalls the strong resemblance which exists between the appearance and general movements of our common flea and the fresh-water shrimp now before us, except that the latter is unable to leap.

During the winter months these animals bury themselves in the mud of the rivulets and streams which they frequent. On the first warm days of spring, however, they reappear, when the larger individuals may generally (as indeed throughout the summer) be seen carrying a smaller one beneath the body, holding it tightly by means of the fingers of its two anterior pairs of hands. These smaller individuals are the females, and this curious courtship, for such it is, lasts seven or eight

days; and Desmars, who published a long note upon the subject (*Mélanges d'Hist. Nat.* 1762, tom. i. p. 217), states that the young are hatched, and escape from the pouch-like scales attached to the base of the legs of the females on the seventh day, after which the latter immediately cast their skins. The young have the curious habit of devouring their own excrement. Geoffroy has also observed that the young take shelter between the legs of their parents, in order to escape danger; and we have found young ones one-tenth of an inch long in this position.

Rösel states that these animals feed upon vegetable matter; but De Geer denies this, and asserts that they are truly carnivorous, eating flesh and filth whenever they can get it, like cray-fish, as well as their dead companions, leaving not a particle unconsumed; on giving them dead flies they immediately crowded around and devoured them, but were never observed to attack living insects. It is not improbable, however, that like some marine species, they will, in default of animal matter, feed upon vegetables, perhaps in a decaying state. They shed their skins in the same manner as cray-fish. One moulted on the 3rd September, whilst under De Geer's observation, the operation being almost instantaneous, and the cast skin closing up so as exactly to resemble the insect itself; but, according to our own observation, it is slowly and quietly performed, the skin splitting between the head and first segment of the body, and between the body and the coxæ of the first three or four pairs of legs as shown in the vignette at p. 360. When the skin is sloughed off, the head-covering, though still attached to it, generally falls in an inverted position, as if thrown forwards. The animals die very soon if taken out of their native element.

AMPHIPODA.
NATATORIA.

GAMMARIDES



DOUBTFUL SPECIES.

We are under the necessity of introducing in the present situation two species described as belonging to the present genus, by our late friend Dr. G. Johnston, of Berwick-upon-Tweed, of which we have unfortunately been unable to meet with any specimen, either in the British Museum collection or amongst the species which he forwarded to us some years since, for the purposes of the present work. We therefore transcribe his descriptions of them.

GAMMARUS DUBIUS.

JOHNSTON, Zool. Journ. iii. p. 178.

“Body between two and three lines long, smooth, corneous; when dead becoming yellowish-brown; marked across the back with a few red lines. Antennæ rather more than one-half the length of the body, slender, nearly equal, armed with very short weak spines; basilar joint of the superior longer than the second or third, which indeed might, with as great propriety, be reckoned amongst the articulations of the last joint [flagellum] as distinct joints; basilar joint of the inferior shorter than the succeeding. Eyes black, roundish, placed at the base of the antennæ. Arms with nearly equal hands, monodactyle, oblong, and not much dilated, and sparingly ciliated. They very much resemble those of *G. punctatus** in their form, but are rather smaller in proportion to the body. Legs spiny, spines not collected into fascicles, but distributed along the whole member; and both the short anterior and long posterior legs are

* *Amphithoe littoralis*. SPENCE BATE.

similar in this respect, monodaactyle. Natatory fins long, divided, and beautifully ciliated. Caudal processes three pairs, long, with aciculate branches. Two rather long conical spinous processes [the two divisions of the middle tail-piece] terminate the tail; and above these are two much smaller papillæ.

“Hab. Amongst confervæ in pools left by the tide; not rare near Berwick.”

Dr. Johnston questions whether it belongs to the same genus as *Pherusa fucicola*, Leach, with which at first he thought it was identical.

“In the figure of *Ph. fucicola*, in the Supplement to the Encyclopædia Britannica, the second joint of the superior antennæ is represented as elongated, the first pair of feet or arms filiform, without any hand, and the hand of the second pair oval, with a very small claw. There is also a considerable difference about the tail, the *Pherusa* having no terminal conical processes.”

Dr. Walker, of Birkenhead, informs us that he has taken specimens, which he considers to belong to this species, occasionally off the mouth of the Mersey, and along the coast to Dee.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

GAMMARUS MACULATUS.*

JOHNSTON, Zool. Journ. iii. p. 176.

“BODY six lines long, smooth, glossy; back dusky, with a faint yellow band across each segment, and a row of yellow spots along each side, most conspicuous on the posterior half of the body; sides lighter coloured, faintly marked with yellow. Antennæ transparent, unspotted, ciliated, with long hairs; superior longest; basilar joint shorter than the second or third. The seta [secondary appendage] is one-half the length of the last joint [flagellum]. Eyes large, oblong, running backwards, and having the appearance rather of a blotch of fine red colour than of eyes. Arms alike, with oval dilated monodactyle hands, hairy, particularly on their inner margin. Legs white, monodactyle, armed with bristles.

“Hab. Sea-coast near Berwick; rare.

“The specimen from which the above description was taken was found among corallines, dredged from deep water. It belongs to Leach’s restricted genus *Gammarus*, of which he has described four species, viz. *G. aquaticus* [*pulex*], *locusta*, *marinus*, and *campylops*.”

* Not *Gammarus maculatus* of Liljeborg.

AMPHIPODA,
NATATORIA.

GAMMARIDES.

Genus—MEGAMCERA.

Megamœra.

SPENCE BATE, Cat. Amph. Brit. Mus. p. 224.

Gammarus (Division A. *aa.*).

MILNE EDWARDS, Hist. des Crust. iii. p. 48.

Gammarus (Division + 2).

LILJEBORG, Ofvers. af Kongl. Vet. Akad.
Forhandl. 1853, p. 452.

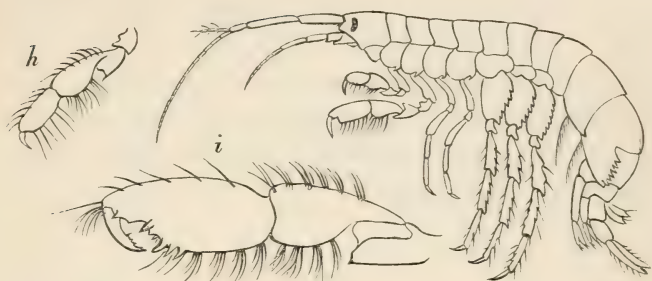
Generic character. Dorsal surface of the pleon without fasciculi of spines. Eyes round. Superior antennæ longer than the inferior. Gnathopoda subchelate, the second pair being the larger. Posterior pair of pleopoda biramous, the branches generally equal-sized. Telson double.

THIS genus bears a near resemblance to that of *Gammarus*. It has, however, been considered sufficiently distinct to be arranged, both by Edwards and Liljeborg, in a separate division. It does not possess the fasciculi of spines planted upon the dorsal surface of the last three caudal segments, which we consider to be characteristic of the genus *Gammarus*. The eyes in this genus are generally round; and the second pair of legs are constantly larger than the first pair, and frequently different in form.

It can be distinguished from the genus *Mœra* by the greater depth of the coxæ, by the relative proportions of the hand of the second pair of legs, and generally by the greater length of the posterior pair of caudal appendages.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



MEGAMCERA SEMISERRATA.

Specific character. Third segment of the pleon having the inferior half of the posterior margin serrated. Eyes oblong. Second pair of gnathopoda having the propodos not broader than the carpus, ovate. Posterior pair of pleopoda with the rami equal. Telson double.

Length $\frac{1}{4}$ inch.

Megamcera semiserrata. SPENCE BATE, Cat. Amph. Brit. Mus. p. 226, pl. xxxix. fig. 6.

THIS animal is slender, and has the inferior moiety of the posterior margin of the third segment of the tail serrated. The eyes are small, and more reniform in shape than in any other species of the genus. The superior antennæ are half the length of the animal, but the inferior scarcely extend beyond the peduncle of the superior. Both pairs of hands are nearly of the same shape, but the second pair are larger than the first, and of a long oval form, having an oblique palm defined by one or two short spines; the finger is short and serrated upon the inner distal half. The coxæ of the anterior four pairs of legs are furnished with a single tooth upon the infero-posterior angle. The last three pairs of legs have the posterior margin of the thighs serrated. The posterior pair of caudal appendages reach far behind

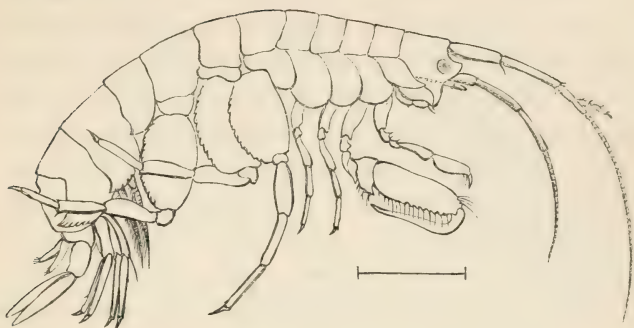
the preceding, and have the branches of equal length. The telson is double, the apex of each division being obliquely truncate, and furnished with a single hair.

The following vignette represents the Mallard Buoy, in Plymouth Sound, near which this species was dredged by us, in company with Dr. Falconer and Professor Kinahan.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



MEGAMÆRA LONGIMANA.

(*Leach's Long-handed Screw.*)

Specific character. Second pair of gnathopoda having the propodos three times as long as broad, with the superior and inferior margins parallel, the latter finely serrated; and the dactylos nearly as long as the propodos. Posterior pair of pleopoda having the rami sub-foliaceous and equal.

Length $\frac{11}{20}$ inch.

Gammarus longimanus. LEACH, MSS. in Collection Brit. Mus. THOMPSON, Ann. Nat. Hist. 1 ser. xx. p. 242. Nat. Hist. of Ireland, iv. p. 396. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58. Ann. Nat. Hist. 2 ser. xix. p. 145. WHITE, Hist. Brit. Crust. p. 184. GOSSE, Mar. Zool. p. 141.

Megamæra longimana. SPENCE BATE, Cat. Amph. Brit. Mus. p. 227, pl. xxxix. fig. 7.

Gammarus levis. BRUZELIUS, Skand. Amph. Gam. p. 60, pl. ii. fig. 10.

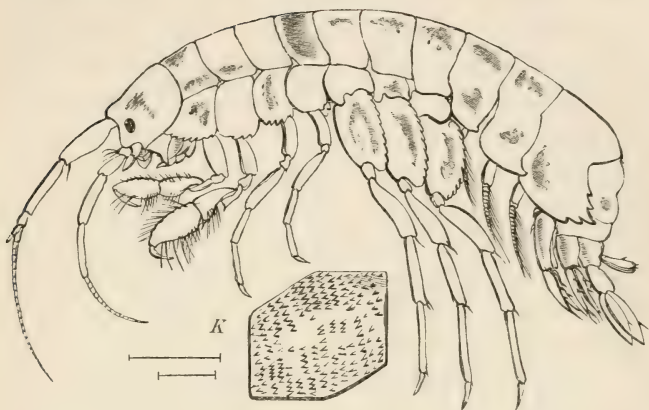
THIS animal is long and moderately robust. The inferior margins of the second and third segments of the tail are serrated. The eyes are round. The superior antennæ are about half the length of the animal; the inferior are much shorter. The first pair of legs are small, having the wrist and hand of nearly equal length. The second pair of legs have the wrist short and inferiorly produced to a point; the lower margin is, moreover,

furnished with several fasciculi of short hairs, curved and anteriorly directed. The hand is continuous with the wrist, but scarcely so broad; it is three times as long as broad, with the upper and lower margins parallel, and has no defined palm; but the finger, which is curved almost at right angles near the base, reaches, in the typical specimens, to the anterior extremity of the projecting point of the wrist. In some which Professor Kinahan has sent to us from Dublin, we have found the finger to be not quite so long. This appears to be also the case in the specimen described as *Gammarus lævis* by Bruzelius from Sweden. The three posterior pairs of legs have the thighs very oval with the posterior margins serrated. The posterior pair of caudal appendages are long; the branches are subfoliaceous, equal in length, and remarkably free from hairs—a peculiarity that appears to be characteristic of these appendages throughout the genus. The telson is double, long, and naked.

This species was long since taken by Dr. Leach on the south coast of England, and remained undescribed in the collection of the British Museum. Mr. Thompson next recorded it from Belfast. We have since received it from Dublin Bay, where it was taken by Professor Kinahan. The Rev. George Gordon has sent us specimens from the Moray Frith, in which the finger of the second pair of hands resembled the Irish form, as did also some sent to us by Mr. Webster from St. Michael's Mount on the coast of Cornwall. Professor Bruzelius records the same form under the name of *G. lævis* among his Skandinavian Gammari, but it does not appear to be numerous anywhere.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



MEGAMÆRA OTHONIS.

Specific character. Posterior and inferior margins of the third segment of the pleon serrated. Inferior margins of the coxæ of the three anterior pairs of legs serrated. Gnathopoda subequal. Propoda ovate.

Length $\frac{1}{2}$ inch.

Gammarus Othonis. EDWARDS, Ann. des Sci. Nat. t. xx. p. 373, pl. x. fig. 11. Hist. des Crust. t. iii. p. 50. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 144. WHITE, Hist. Brit. Crust. p. 184.

Megamæra Othonis. SPENCE BATE, Cat. Amph. Brit. Mus. p. 227, pl. xxxix. fig. 8.

THE animal is long; and has the inferior half of the posterior margin as well as the posterior half of the inferior margin of the third segment of the tail serrated. The eyes are round and black. The superior antennæ are about one-third of the length of the animal; and the peduncle is as long as the flagellum, this latter portion varies from fourteen to twenty-five articuli, and the secondary appendage, which is short, from two to three. The inferior antennæ are about one-third shorter than the superior; the flagellum is not half the length of the

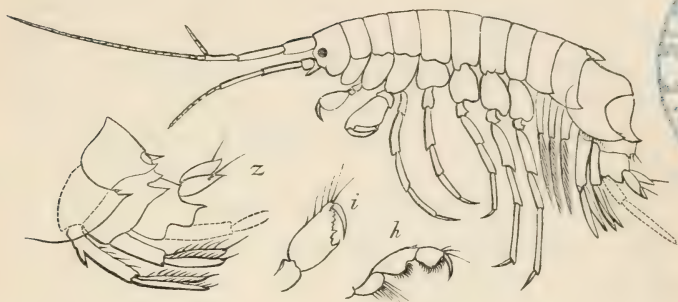
peduncle, and varies from nine to fifteen articuli. This great variation in the number of articuli to the flagellum is dependent upon age, sex, and accident, and demonstrates the little value, in a specific point of view, which ought to be placed upon the length of this portion of the antennæ. The flagellum will sometimes double the number of its articuli in a single moult.

The coxæ of the three (or four) anterior pairs of legs have the inferior margin serrated. The hands of the first two pairs are long-ovate, slightly tapering, and having the palm not defined; the second pair being rather larger than the first. The last three pairs of legs have the thighs oval, and the posterior margin serrated. The last pair of caudal appendages are long, and have the branches subfoliaceous, and equal in length. The colour of the animal is whitish, faintly marked with blotches of rose-colour. The skin, as seen through a low power of the microscope, is rough; this is occasioned by its being covered by a series of minute points, which appear to stand obliquely from the surface, as shown in our cut.

We have dredged this animal in Plymouth Sound, and found it among the refuse brought in by the trawlers. Mr. Loughrin has sent it to us also from Polperro.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



MEGAMCERA ? ALDERI.

Specific character. Posterior dorsal margin of the third and fifth segments of the pleon produced to a small tooth. Second pair of gnathopoda larger than the first, having the propodos ovate, palm oblique, serrated, and defined by a tooth.

Length $\frac{5}{20}$ inch.

Megamcera Alderi. SPENCE BATE, Cat. Amph. Brit. Mus. p. 228, pl. xl. fig. 1.

THE third segment of the tail is posteriorly produced in the middle of the dorsal margin into a small point. The fourth does not appear to be so produced, whilst the fifth has a small central, and close upon each side a large lateral, tooth. The eyes are round or oval. The superior antennæ are about two-thirds of the length of the animal; the flagellum longer than the peduncle, and the secondary appendage consisting of three articuli. The inferior antennæ reach a little beyond the peduncle of the superior. The first pair of legs have the wrist longer than the hand; the palm is oblique and longer than the inferior margin. The second pair of legs are larger than the first; the hand is nearly of the same form,

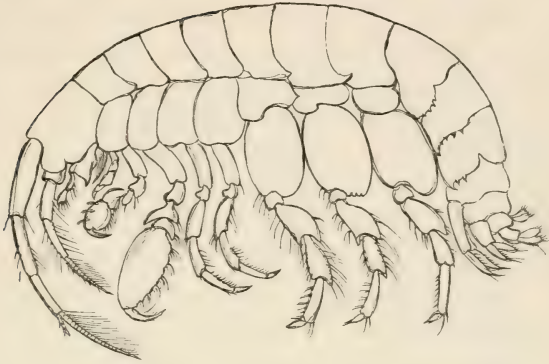
but the palm is serrated and defined by a distinct tooth. The posterior pair of caudal appendages are wanting in each of the specimens that we have seen. In the Catalogue of Amphipoda of the British Museum, this pair of appendages is represented as having one branch very long and the other nearly rudimentary, in which respect the animal differs from the remainder of the British species of this genus.

The character of this animal appears to justify its admission as a species in the present genus, but we desire to express our conviction that it will ultimately be ascertained to be the female of a species of *Melita*, probably *M. proxima*. A similar consideration induces us to forbear adding two or more species which, as we observed in page 336, only differ in the form of the hands from certain species of the genus *Melita*.

Our first specimen of this species was received from the eminent naturalist after whom we have named it, and by whom it was dredged on the coast of Northumberland. We have since obtained it from Mr. Edward of Banff.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



MEGAMÆRA BREVICAUDATA.

Specific character. Posterior margin of the first three segments of the tail slightly serrated. Superior antennæ having the flagellum short. Second pair of gnathopoda larger than the first. Propoda long-ovate. Posterior pair of pleopoda with the rami short.

Length $\frac{6}{20}$ inch.

Gammarus brevicaudatus. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 58.
Ann. Nat. Hist. 2 ser. xix. p. 145. WHITE,
Pop. Hist. Brit. Crust. p. 185 (not of Milne
Edwards).

Megamæra brevicaudata. SPENCE BATE, Cat. Amph. Brit. Mus. p. 228,
pl. xl. fig. 2.

THIS species was first mistaken, by Mr. Spence Bate, for *Gammarus brevicaudatus* of Edwards, with the description of which it was supposed to correspond. The opportunity since afforded to us of examining the typical specimen preserved in the Museum of the Jardin des Plantes, having demonstrated that the Parisian specimen belongs to another genus, we have retained the specific name for the present animal.

The body is robust, with the hinder portion comparatively short. The three anterior segments of the tail have the posterior margin slightly serrated. The su-

perior antennæ are about one-third of the length of the animal; but the peduncle is more than twice the length of the flagellum. The inferior antennæ do not reach beyond the peduncle of the superior. The first pair of legs are small, and have the hand ovate, the palm being oblique, slightly convex, and imperfectly defined. The second pair of legs are much longer than the first, and have the wrist very short, the hand is long-ovate, the palm oblique, and defined by a small point. The last pair of caudal appendages have the branches scarcely longer than the peduncle, and reach but little beyond the preceding pair. The telson has the apex of each division excavated, and furnished with two or three hairs.

We have dredged this species off Plymouth; and have also received it from the Moray Frith through the kindness of the Rev. Geo. Gordon.

AMPHIPODA.
NATATORIA.

GAMMARIDES.

Genus—EISCLADUS.*

Generic character. Slightly compressed. Eyes on a prominently-advanced lobe between the superior and inferior antennæ. Superior antennæ without a secondary appendage. Gnathopoda subchelate. Coxæ of the third pair of pereiopoda having the anterior lobe as deep as the coxæ of the second. Posterior pair of pleopoda biramous, rami unequal. Telson squamiform, single.

THIS genus appears to approximate somewhat closely to the description given of *Melita* by Dana, differing only in the important feature of size of the coxæ of the fifth pair of legs which Dana says are "much shorter than those of the fourth."

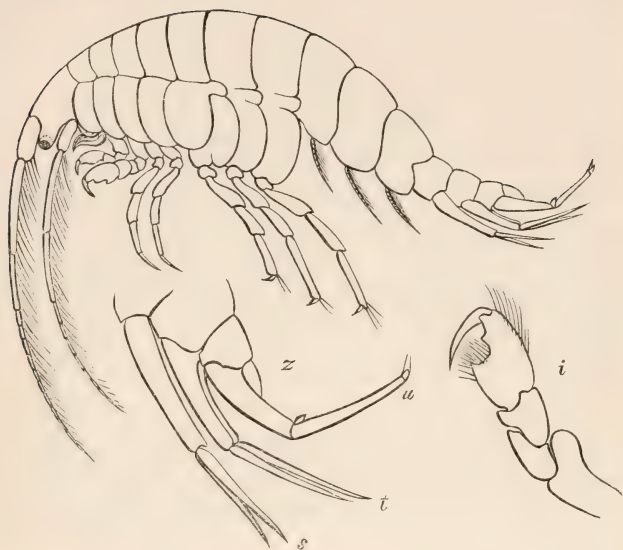
The genus, moreover, has a close affinity with that of *Amphithoë*, from which it differs only in the form of the last pair of caudal appendages which in this genus resemble those of *Melita*.

The eyes are situated on a lobe prominently advanced between the superior and inferior antennæ. The superior antennæ have not a secondary appendage, and are a little longer than the inferior. The hands are subequal and subchelate. The coxæ of the fifth pair of legs are as deep as those of the fourth. The last pair of caudal appendages are unequally biramous, one branch being very minute; and the middle tail-piece is squamiform, and consists of a single plate.

* Εἰς one, ἡλᾶδος branch, in allusion to the structure of the posterior pair of pleopoda.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



EISCLADUS LONGICAUDATUS. N. S.

Specific character. Eyes round. Superior antennæ more than half the length of the animal. Inferior antennæ nearly as long as the superior, both strongly setose on the inferior margin. Second pair of gnathopoda having the propodos with the palm excavated. Posterior pair of pleopoda having the inner ramus rudimentary, the outer one longer than the peduncle, and tipped with a second joint or strong spine. Telson lanceolate.

Length $\frac{1}{2}$ inch.

THE body of this animal is arched; the sixth segment being nearly three times as deep as the first. The eyes are round, and situated on a lobe projecting forward between the superior and inferior antennæ. The superior antennæ are more than half the length of the animal, and the peduncle is longer than the flagellum. The inferior antennæ originate posteriorly, and do not reach quite as far as the superior; the peduncle is longer than the flagellum. In both pairs the peduncle as well

as the flagellum is strongly setose along the under surface. The second pair of hands are a little larger than the first, of an oval form, with the palm deeply excavated and slightly ciliated. The walking legs are nearly equal in length. The ultimate pair of caudal appendages have the peduncle robust, and as long again as the middle tail-piece; the branches are very unequal, the inner being rudimentary, and the outer longer than the peduncle, and terminating in a small second joint, resembling a short stout spine. The central tail plate is lanceolate.

This species forms a curious link between the genera *Amphithoë* and *Melita*; in fact, it is only separated from the nest-building group by the form of the caudal appendages.

It was dredged during the last summer for the first time by the Rev. A. M. Norman and Mr. Gwyn Jeffreys, in Outer Skerries Harbour, Shetland, in from two to five fathoms of water.

Subdivision—DOMICOLA.

THE animals which are grouped under this subdivision have either the lower antennæ developed into a strong subpediform appendage, on which the hairs as they approach the distal extremity are developed into strong spines, more or less curved into the form of hooks, or some of the caudal appendages are furnished with strong hook-like organs.

They invariably construct abodes in which they take shelter and nourish their young. These abodes are, by some species, built with weed or stones, connected together by a cement excreted by the animal, by others of mud only; while others again excavate a dwelling in the soft clay at the bottom of the sea, or into submarine timber.

They have the power of swimming, and with but few exceptions can walk without falling upon their side.

This subdivision represents Milne Edwards' tribe of MARCHEURS, and comprises the two families, COROPHIIDÆ and CHELURIDÆ.

Fam.—COROPHIIDÆ.

IN this Family all the segments of the body and tail of the animals are present and distinctly developed.

In one genus alone we find the ultimate pair of caudal appendages reduced to a rudimentary condition, as if approaching that preliminary step of deterioration which we find so largely carried out in the Aberrant group of Amphipoda.

It is synonymous with the same family in Dana's great work, and consists of two subfamilies, PODOCERIDES and COROPHIIDES.

Subfamily—PODOCERIDES.

SUPERIOR antennæ shorter than the inferior. Inferior antennæ stouter than the superior. Posterior pair of pleopoda furnished with hook-like spines.

The species of this subfamily have the superior pair of antennæ less robust than the inferior. The inferior appear to be always used as legs in climbing, and are generally strong, sometimes forming a very powerful organ. This latter appendage is frequently thickly fringed with hairs, which in some instances, towards the extremity, stiffen into spines which are curved at the apex into strong hooks.

The posterior pair of caudal appendages are always furnished with more or less perfect hooks, and in some genera the short middle tail-piece also.

They generally build their abodes with materials collected in the vicinity, either in the form of nests or tubes.

AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—AMPHITHOË.

- Amphithoë*. LEACH, Edin. Encyc. vii. p. 402. Linn. Trans. xi. p. 361.
SPENCE BATE, Ann. Nat. Hist. 2 ser. vol. xix. p. 147. Cat.
Amph. Brit. Mus. p. 233. WHITE, Hist. Brit. Crust.
p. 200. DANA, U.S. Explor. Exped. p. 935. (*part*).
EDWARDS Hist. des Crust. t. iii. p. 28. DESMAREST,
Consid. sur Crust. p. 268.
- Anisopus*. TEMPLETON, Trans. Ent. Soc. Ser. i. v. i. p. 188.
- Cymadusa*. SAVIGNY, Egypte. Crust. pl. 26.
- Pleonexes*. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 147.

Generic character. Coxa of the third pair of pereopoda having the anterior lobe as deep as the coxa of the second, and the posterior lobe very small. Second pair of gnathopoda larger than the first. Posterior pair of pleopoda biramous; outer ramus, terminating in one or more short slightly curved spines; the inner one in a subfoliaceous lamina. Telson single squamiform.

THIS genus may at once be identified by the deep coxa of the fifth pair of legs, the form of the superior antennæ, and the caudal appendages.

The eyes are situated on a lobe between the superior and inferior antennæ. The antennæ are subequal; the inferior terminating in a multi-articulate flagellum. The second pair of legs have the hands rather larger than those of the first. The coxa of the fifth pair of legs has the anterior lobe as large and as deep as the coxa of the preceding pair of legs, while the posterior lobe is very small, the thigh, as usual, articulating between them. The posterior pair of caudal appendages have the branches very short, the inner one being subfoliaceous, and the outer furnished with spines curved like hooks. The central caudal plate is single, and terminates in a rounded apex.

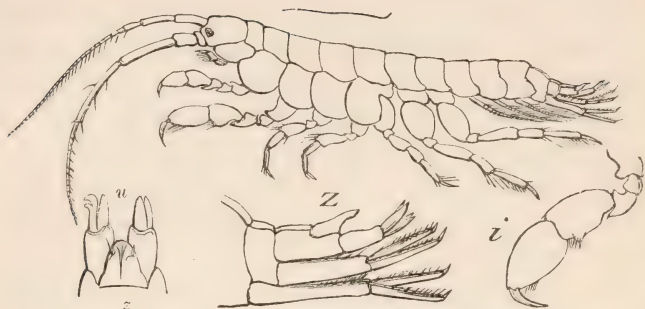
This genus appears to have a large geographical range ; the species having been found both in the Arctic and Antarctic Seas, as well as in the tropical regions, that is, if *Amphithoë Azteca* of Saussure belongs to this genus, which, however, from the description, appears to be rather doubtful. One species is recorded by Professor Say from the freshwater marshes of South Carolina, but his description is not sufficiently perspicuous for us to determine whether his *Amphithoë dentata* really belongs to this genus or not.

The accompanying vignette of Tynemouth was kindly drawn for us by Miss Hancock, of Newcastle.



AMPHIPODA,
NATATORIA.

PODOCERIDES.



AMPHITHOË RUBRICATA.

Specific character. Superior antennæ nearly two-thirds the length of the animal ; peduncle reaching to the extremity of the penultimate joints of the peduncle of the inferior ; flagellum long and slender. Inferior antennæ one-third shorter than the superior. Gnathopoda having the propoda subequal ; carpi inferiorly produced to a small extent ; propoda ovate, the palmæ oblique and imperfectly defined. The colour of the adult animal is a bright crimson.

Length $\frac{1}{2}$ inch.

Cancer (Gammarus) rubricatus. MONTAGU, Linn. Trans. ix. p. 99, pl. v. fig. 1.

Gammarus rubricatus.

Amphithoë rubricata.

LEACH, Edin. Encyc. vii. p. 402.

LEACH, Edin. Encyc. Append. p. 432.

Linn. Trans. xi. p. 360. Suppl. Enc.

Brit. 1, p. 425. DESMAREST, Consid.

Crust. t. 45, fig. 9. SAMOUELLE, Ent.

Comp. p. 104. THOMPSON, Ann. Nat.

Hist. xx. p. 242 (Oct. 1847). MILNE

EDWARDS, Ann. Sci. Nat. xx. p. 377.

Hist. des Crust. iii. p. 33. SPENCE

BATE, Rep. Brit. Assoc. 1855, p. 59.

Ann. Nat. Hist. 2 ser. vol. xix. p. 147.

Cat. Amph. Brit. Mus. p. 233. WHITE,

Hist. Brit. Crust. p. 200. GOSSE, Mar.

Zool. i. p. 141, fig. 258.

THE figure at the head of this description is taken from Montagu's type in the British Museum. But the

specimen being a dried one it does not fairly represent the living animal, which has the back somewhat elevated near the middle rather than depressed. The eyes are nearly round, and occupy a position on a lobe between the superior and inferior antennæ. The superior antennæ are about two-thirds the length of the animal; the peduncle reaching to the extremity of the penultimate joint of the peduncle of the inferior; the flagellum is long and slender, represented much too short in the figure, being probably broken in the long-preserved specimen of Montagu. The inferior antennæ are one-third shorter than the superior, and the flagellum is scarcely longer than the last joint of the peduncle. The first two pairs of legs are nearly of the same size. The wrists are as broad anteriorly as the hands; the hands are ovate, having a slightly-defined palm, and the fingers are serrated in the young but scarcely so in the adult specimens, while in the very young there is but a single subapical tooth and several hairs. The next two pairs of legs are short, but have the thighs broad. The fifth pair are very short, but the two last are longer and have the distal extremities not narrowed, and furnished with two or three short stiff spines which assist in perfecting the prehensile grasp of the finger when it shuts. The last pair of caudal appendages terminate in a foliaceous plate and well-developed hooks.

The colour of adult specimens is a brilliant crimson, spotted with several large blotches of white with small spots of black near their margins. By the aid of the microscope the colour is perceived to be due to a close network of stellate pigment covering a corneous ground.

In the very young animal this corneous tint universally prevails except the few white blotches. When the animal is somewhat grown some small spots of red are

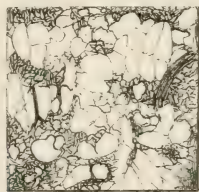
sprinkled over the surface; these upon examination are found to possess a more or less stellate condition, which gradually increases as the animal grows older, until it ultimately spreads over the entire surface, which appears of a uniform rich red colour. It was on this account no doubt that Col. Montagu gave the animal its characteristic specific name.

This animal generally lives in a nest of its own construction. Its common resting-place is at the roots of *Laminariæ* and other plants, or on the under sides of stones, at the bottom of the sea in a few fathoms of water, seeking some secure nook or quiet corner in which to dwell in peace and safety. Some specimens which we kept alive built for themselves nests against the surface of the glass vessel in which they were confined. On the side of the vessel grew young fronds of weed. Each position which was selected by one of the animals for its abode was swept clean for a distance round the nest by the long antennæ, proving distinctly that the animal reaches out and collects material to assist in the construction of its cell. Upon placing one of these newly-constructed dwelling-places under the microscope we found that the many bits of weed, chiefly green ulva, were matted together by some exquisitely delicate fibres. This fibrous material possessed the appearance of having been spun or twisted, since frequently small loops were formed by a fibre having been twisted upon itself.

We have not been able to discover whether this thread-like web be excreted by the mouth, or whether or not there be an especial organ for its production, but we hope that it will not be long before some naturalist will be able to throw some light upon this curious and interesting subject.

In some specimens recently sent to us from Banff we found these nests to consist chiefly of this exquisitely fine thread, built and twisted in with very little foreign material such as straw and weed. One spot in the nest, which from its thinness and position offered a favourable place for examination without being ruptured, was observed under the microscope to be arranged in a loose kind of network as fairly represented in our vignette.

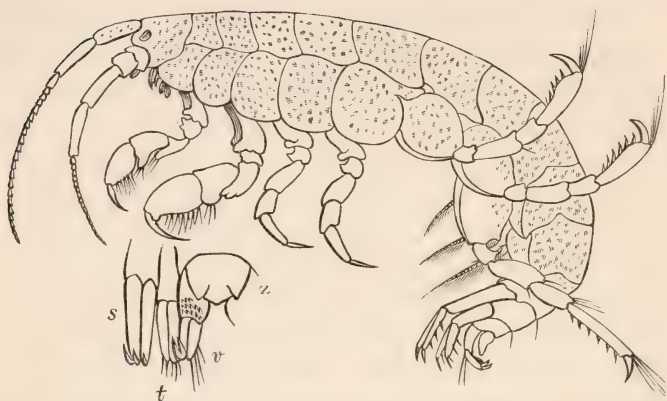
The type was taken by Col. Montagu on the south coast of Devonshire, probably at Salcombe. Some specimens were dredged by us in Plymouth Sound, upon stony ground between the eastern end of the break-water and Bovisand, of a most brilliant colour. Mr. Harris, of Sidmouth, sent us a few specimens from Penzance procured on the shore at low spring tide. The Rev. A. M. Norman and Mr. Jeffreys have taken it in from two to five fathoms in Outer Skerries Harbour, also in four fathoms one mile north of Whalsey Lighthouse, Shetland; Mr. Norman has also sent it to us from Cullercoats. It is also recorded from Strangford Loch by Thompson and Hyndman in the "Annals of Natural History" for 1847.



A portion of the Nest of *Amphithoë rubricata*, as seen under the microscope, with an object glass of $\frac{1}{3}$ of an inch.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



AMPHITHOË LITTORINA.

Specific character. Eyes small, round. Superior antennæ not more than half the length of the animal. Inferior antennæ almost as long as the superior. Gnathopoda having propoda tapering to the extremities; palmæ corresponding with the inferior margins; dactyla not having the inner margin serrated. Colour, green, with black spots.

Length $\frac{3}{4}$ inch.

Amphithoë littorina. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 148. Cat. Amph. Brit. Mus. p. 234, pl. xli. fig. 2. WHITE, Hist. Brit. Crust. p. 200.

Amphithoë punctata. JOHNSTON, Zool. Journ. iii. p. 127 and 490. Ann. Nat. Hist. xx. p. 243. WHITE, Cat. Crust. Brit. Mus. p. 50. W. THOMPSON, Ann. Nat. Hist. xx. p. 243 (October, 1847) (not of Say, nor of Costa, Rend. Accad. Sci. di Nap. 1853, p. 176, nor *Podocerus punctatus*, Spence Bate).

THIS species, which is very readily distinguishable from *A. rubricata* whilst alive, requires close observation to determine its identity in a preserved state. The body is long and laterally compressed. The eyes are small, round, and black. The antennæ are annulated with

brown, and are nearly of the same length, and are not quite half the length of the animal;* the inferior have the joints of the peduncle armed with strong hairs. The first two pairs of legs are subequal, but the second is rather the larger. There is a deep semilunar fissure between the wrist and the hand and between the wrist and the preceding joint, which does not occur in *A. rubricata*. The first pair have the hand gradually tapering to the extremity; the palm is straight and occupies nearly the whole length of the inferior margin. The second pair have the hand continuous with the wrist, and formed much like that of the first pair; the palm is long and not clearly defined;† the finger is nearly as long as the inferior margin, and has the inner margin smooth. The first two pairs of walking legs are short and robust. The three posterior gradually increase in length and have the inner margins of the hands furnished with a longitudinal row of short stout spines. The posterior pair of caudal appendages do not reach beyond the preceding pair, and have the inner ramus foliaceous and the outer styliform, and furnished with two short, hook-like spines. The central tail-plate is obtusely triangular. The colour of the animal is olive-green, covered all over, especially on the sides, with minute black spots—changing when dead to a sand colour—and marked on the back with numerous impressed punctures.

This species is generally found amongst the weed close in shore, associated with *Gammarus locusta*. It may readily be detected by its size: like “a Triton amongst

* Dr. Johnston describes the upper antennæ in his *G. punctatus* as nearly as long as the body.

† Dr. Johnston describes the hands of the second pair as having an obsolete tooth.

the minnows," it is found one to a hundred of the Gammari.

Johnston found it at Berwick, and presented the specimen to the British Museum under the name of *G. punctatus*. The *G. punctatus* of Say, which we take to be identical with Stimpson's *A. virescens*, has, in both Say's and Stimpson's description, parts sufficiently distinct to separate it from the British species.

A. littorina is to be found most probably all round our coast. Our friend, the late Mr. Geo. Barlee, sent it to us from Skye, and the Rev. Geo. Gordon from the Moray Frith. We have seen a specimen taken by the Rev. A. M. Norman in the Outer Skerries Harbour, Shetlands. Dr. Johnston found it very common amongst confervæ in pools left by the tide near Berwick. Mr. Webster has forwarded to us specimens from Tenby; and we have found them common between the tide marks at Plymouth. Professor Kinahan has taken it in county Clare, Ireland. Mr. Jeffreys has also found it on the coast of Normandy, but we do not remember its having been among the Crustacea found by him on the coast of Italy. Mr. Rayner has found at Hummock's Island, Basse's Straits, a specimen that appears to be identical with this species; and we can detect no character of sufficient importance that will identify *A. Picta* of Rathke, from the Crimea, as a distinct species.

We believe that this species frequently constructs its nest by rolling together the edges of a leaf of growing seaweed and cementing them together so as to form a tube open at each end. We observed the fact some time since but have not since verified it. Dr. Johnston describes the "burrows" of his *G. punctatus* as being from one to two inches long, composed of pieces of seaweed,

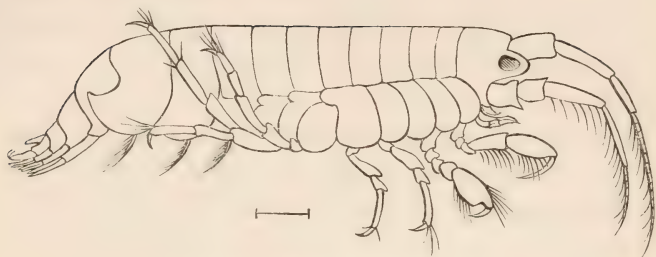
and glued internally with a smooth and glutinous membrane ; it is attached to the underside of stones, or is embedded in some entangled fucus or conferva. A male and female reside in each furrow, and Dr. Johnston had observed them, when expelled from it, repeatedly return and re-enter it.

The following sketch was kindly drawn for this work by Miss Gordon Cumming, of Altyre. It represents Hell's Hole, *alias* Hallis Hale, *i.e.* the Mouth of the Harbour.



AMPHIPODA.
NATATORIA.

PODOCERIDES.



AMPHITHOË ALBOMACULATA.

Specific character. Body robust. Antennæ not longer than half the animal. Second pair of gnathopoda having the propodos long-ovate, with the palm concave.

Length $\frac{1}{4}$ inch.

Amphithoë albomaculata. KROYER, Nat. Tidsk. ny Række, andet B. p. 67. Voyage en Scan. pl. xi. B. fig. 1.

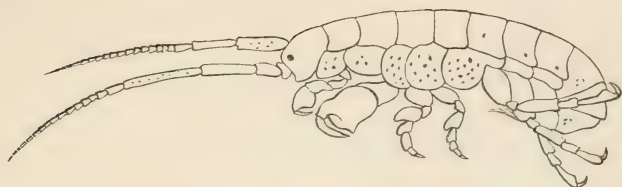
THIS species closely assimilates to *A. rubricata*, but is readily distinguished, by the robust form of the animal, the shortness of the superior antennæ, and the concave palm of the second pair of hands.

In the Catalogue of Amphipoda of the British Museum, Mr. Spence Bate, not then having seen a specimen has (p. 251), with hesitation, followed Bruzelius in uniting this species with *A. podoceroïdes* of Rathke. But the specimen from which our figure is taken so closely corresponds with that of Kroyer in his magnificent work on the Crustacea, &c., of Scandinavia, that we do not hesitate to consider our British species as being identical with it. As connected with our Fauna it was dredged for the first time in the summer of 1861, in from seventy to ninety fathoms sixty miles east of Shetlands, by the Rev. A. M. Norman and Mr. J. G. Jeffreys.

AMPHIPODA.

PODOCERIDES.

NATATORIA.



AMPHITHOË GAMMAROIDES.

Specific character. Eyes small, round, and black. Superior antennæ shorter than the inferior. Second pair of gnathopoda larger than the first; propodos subquadrate.

Length $\frac{1}{3}$ inch.

Amphithoë Gammaroides. SPENCE BATE, Cat. Amph. Brit. Mus. p. 235, pl. xli. fig. 4.

Pleonexes Gammaroides. SPENCE BATE, Ann. Nat. Hist. 2 ser. vol. xix. p. 147. WHITE, Pop. Hist. Brit. Crust. p. 199.

THE eyes of this species are very small, round, and black. The superior antennæ are more than half the length of the animal. The first joint of the peduncle is longer than the head, the second joint is longer than the first, and the third is not half the length of the second; the flagellum, which is imperfect in our typical specimen, is about the length of the peduncle. In the inferior antennæ the antepenultimate joint of the peduncle extends to half the length of the first joint of the upper; the penultimate as far as the extremity of the second joint of the upper; while the ultimate is nearly as long as the two preceding; and the flagellum is about the same length as the last joint of the peduncle, and therefore reaches beyond the extremity of the superior, unless the flagellum of the latter be preternaturally long. It was on account of the greater length of the inferior to the superior antennæ that the original describer first

established for it a separate genus, which he has since cancelled in the "Catalogue of Amphipoda" for the British Museum. The first pair of legs have the hands slightly dilated, and gradually increasing in diameter to the palm, against which the finger, when shut, closely impinges for the entire length. The second pair of legs have the wrist dilated and continuous with the hand, which is large, diagonally quadrate, the palm being oblique and defined by an obtuse tooth. The third and fourth pairs of legs are short and strong; they have the thighs dilated anteriorly. The fifth, sixth, and seventh have the distal extremity of the sixth joints dilated so as to increase their prehensile power, a circumstance which suggests to us the idea that this imperfectly-examined animal may belong to the genus *Sunamphithoë*.

The two or three specimens of this species which we have seen are dried and imperfect; they were sent to us by the late Mr. Barlee, who obtained them at Penzance.

The colour of the specimens is a tolerably fresh green, spotted with rather large and distant black points, which are most abundant upon the sides of the animal.

AMPHIPODA.

NATATORIA.

PODOCERIDES.

Genus—SUNAMPHITHOË.

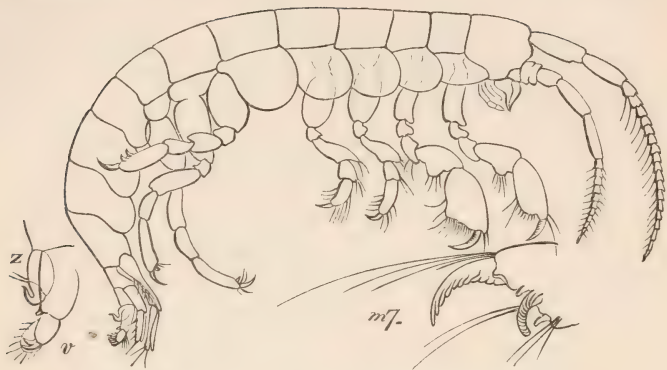
- Sunamphithoë*. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 148. Cat. Amph. Brit. Mus. p. 250.
Synamphithoë. WHITE, Hist. Brit. Crust. p. 201.

Generic character. Like *Amphithoë* except that the telson is developed into the form of a hook, and the three posterior pairs of legs have the sixth joint dilated at its extremity.

THIS genus is very near to *Amphithoë*, with which it is very likely to be confounded. It has, however, the second pair of hands more frequently larger, and the walking legs have the hands developed somewhat as in *Isæa*, having a small palm at the extremity, so that they assume the appearance of being as much adapted for prehension as for walking. The telson is developed into a distinct and powerful hook, which is evidently a modification of that organ for some special purpose. It is this last feature which distinguishes this genus from every other of the family. As yet but two British species are known.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



SUNAMPHTHOË HAMULUS.

Specific character. Antennæ subequal : superior pair one-third as long as the animal, the flagellum not being longer than the peduncle : inferior pair having the flagellum scarcely longer than the last joint of the peduncle. Gnathopoda subequal. Telson in the form of a very perfect hook.

Length $\frac{14}{20}$ inch.

Sunamphithoe Hamulus. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 148.
Cat. Amph. Brit. Mus. p. 250, pl. xliii. fig. 5.
WHITE, Pop. Hist. Brit. Crust. p. 202.

THE eyes are small, round, and black. The antennæ are nearly of the same length and about one-third that of the animal; in the upper pair the flagellum is about the same length as the peduncle; in the lower pair the flagellum is much shorter, not being longer than the last joint of the peduncle. The hands of the first two pairs of legs are nearly of the same size, the second being slightly the larger, and the fingers of both are serrated. The first two pairs of walking legs are short and strong; the last three are strong and longer; the distal extremity of the hand being furnished with a palm armed with two short, obtuse spines and one long, blunt, spirally-curved spine, against which the finger, which is obsoletely

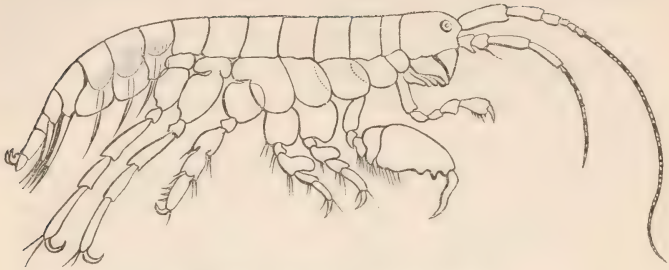
serrated, acts and forms a strong prehensile grasp. The last pair of caudal appendages have the branches short, the inner being broadly foliaceous, the outer tipped with two short hooks; the telson terminates in a strong and well-formed hook, that is evidently intended for some special purpose.

We have received specimens of this species, of which the habits are unknown, from the Moray Frith, where they were taken by the Rev. Geo. Gordon; from Rock-pools, Penzance, where they were found by Mr. Harris. They have been sent to us from the Shetlands, by the late Mr. Barlee; and the Rev. A. M. Norman has dredged them in from two to five fathoms in the Outer Skerries harbour in company with Mr. Jeffreys.



AMPHIPODA.
NATATORIA.

PODOCERIDES.



SUNAMPHITHOË CONFORMATA.

Specific character. Eyes small, round, and white. Superior antennæ longer than the inferior. Second pair of gnathopoda much larger than the first; propodos long-ovate, tapering to the extremity; palm very oblique, waved.

Length $\frac{8}{20}$ inch.

Sunamphithoë conformata. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59.
Ann. Nat. Hist. 2 ser. xix. p. 148. Cat.
Amph. Brit. Mus. p. 251, pl. xliii. fig. 6.
WHITE, Hist. Brit. Crust. p. 202.

IN this species the eyes are round and white, with a red spot in the middle. The superior antennæ are nearly as long as the animal. The inferior antennæ are but little more than half the length of the superior. The second pair of legs are furnished with a hand twice the size of that of the first pair: it is of a long oval form, somewhat tapering to the extremity; the palm is subparallel with the upper margin, and is waved nearest to the distal extremity. The first two pairs of walking legs have the thighs very broadly developed. The third pair of walking legs are very short; the two last longer and of uniform length. The posterior pair of caudal appendages have the inner ramus foliaceous, and the outer terminating in two powerful hooks. The telson has not been clearly observed, but we believe that it agrees with our generic description.

The animal is of a yellowish or fawn colour when alive, with a few red marks corresponding with the points where the legs are attached to the body. We obtained our first specimen at Plymouth, and a second was sent to us by the late Mr. Barlee, who took it off the Shetlands.

The following vignette represents some Laver gatherers.



AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—PODOCERUS.

- Podocerus*. LEACH, Linn. Trans. xi. p. 360. DESMAREST, Consid. sur Crust. p. 269. SAMOUELLE, Ent. Comp. p. 185. EDWARDS, Hist. des Crust. t. iii. p. 63. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 148. GOSSE, Mar. Zool. p. 141. WHITE, Hist. Brit. Crust. p. 197. BRUZELIUS, Skand. Amph. Gamm. p. 20.
- Jassa*. LEACH, Linn. Trans. xi. p. 361. DESMAREST, Consid. sur Crust. p. 269. WHITE, Hist. Brit. Crust. p. 198.
- Ischyrocerus*. KROYER, Grön. Amfip. p. 59.
- Cratophium*. DANA, U. S. Explor. Exped. p. 841.
- Elasmopus*. COSTA, Rend. della Reale Accad. delle Scienze di Napoli, 1853, p. 170.

Generic character. Superior antennæ having a minute secondary appendage. Inferior antennæ, not multiarticulate, robust; flagellum short and tipped with hooks. Second pair of gnathopoda having the propodos largely developed. First and second pair of pereiopoda having the base very broad; third pair having the coxa scarcely as deep as that of the preceding pair, and the lobes not equal in size. Posterior pair of pleopoda biramous, one ramus being furnished with one or more hooks. Telson squamiform.

THIS genus has the eyes generally very small, and situated on a very prominent lobe, projected laterally between the superior and inferior pairs of antennæ; this lobe is formed of a plate so thin that we have frequently observed the ocular mass to stand as a projecting ball on the inner side. The superior antennæ are invariably furnished with a secondary appendage, which is generally very small. The inferior antennæ are longer, and more powerful than the superior; the peduncle is long, and the flagellum very stout and strong, never multiarticulate,

but consisting of three or four very long articuli; some of the hairs upon the distal extremity of each articulus attaining a strong spine-like condition, and becoming shorter and stronger towards the apex of the organ, where also they become curved or hooked. The second pair of legs have the hand much longer than that belonging to the first pair. The first two pairs of walking legs are very short and robust, and the thighs are generally broadly dilated. The third pair are also short, and have the lobes of the coxa very large. The last pair of caudal appendages are double branched, the branches are very short, and one of them (the inner) is furnished with two or three hook-like spines.

This genus, as well as that of *Jassa*, was established by Dr. Leach, but, after a careful consideration of the meagre descriptions of these two genera, as well as an examination of the specimens preserved in the British Museum, we have not been able to discover any character to distinguish the two groups. In this we are the more confirmed from the fact that specimens of each genus were mingled together, as also some totally distinct from either. Dana's description of *Cratophium* also appears to be identical with this genus, and we can only account for that clear observer founding it as a distinct genus from the fact that Dr. Leach's description is not sufficient for identification without the assistance of specimens.

This genus appears to be more generally distributed in the northern than in the southern hemisphere, although one species was taken by Dana on the coast of Brazil, and another in the Eastern Archipelago.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



PODOCERUS PULCHELLUS.

Specific character. Superior antennæ not longer than the peduncle of the inferior. Second pair of gnathopoda having propodos with the palm parallel with the superior margin, and defined by a long tooth-like process.

Length $\frac{1}{4}$ inch.

Jassa pulchella.

LEACH, Edin. Encyc. vii. p. 433. Suppl. Enc. Brit. i. p. 426. Linn. Trans. xi. p. 361. DESMAREST, Consid. sur les Crust. p. 269. SAMOUELLE, Ent. Comp. p. 105. MILNE EDWARDS, Règne Animal. pl. lxi. fig. 3. (Edit. Crochard, from Leach's type.)

Podocerus pulchellus.

MILNE EDWARDS, Ann. des Sci. Nat. t. xx. p. 384. Hist. des Crust. t. iii. p. 64. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 148. Cat. Amph. Brit. Mus. p. 253, pl. xliii. fig. 8. WHITE, Pop. Hist. Brit. Crust. p. 198. GOSSE, Mar. Zool. p. 141.

Podocerus calcaratus.

RATHKE, Nov. Act. xx. p. 91, pl. iv. fig. 9. BRUZELIUS, Skand. Amph. Gam. p. 22.

THE eyes are small in most of this genus, but appear to be particularly so in this species. The superior antennæ do not reach quite to the extremity of the peduncle of the inferior. The inferior antennæ are very nearly half the length of the animal; the flagellum is shorter than the last joint of the peduncle, it consists of four articuli, and is furnished at the apex with double-pointed curved spines. The coxæ of the first two pairs of legs are short, but those of the two succeeding are more than twice the depth of their respective segments of the body. The first pair of hands are small and sub-triangular; the palm oblique and totally straight, fringed along the margin with long and short hairs, all double-headed, the shorter being stronger and spine-like; the finger is deeply serrated along the distal moiety of the inner margin. The second pair of hands are large, equalling in length the head and the first two segments of the body; the palm is slightly concave, following a line parallel with that of the upper margin, and is defined by a long process or tooth, the apex of which antagonizes with the extremity of the finger—this thumb-like process is sometimes nearly as long as the palm and terminates abruptly. The next two pairs of legs are short and robust; the last three gradually exceed each other in length.

Dr. Leach (Linn. Trans. xi. p. 361) describes two varieties of this species,—*a*, those with the hands of the second pair armed with an elongated obtuse tooth; and, *b*, those with the same hands having the internal edge tridentate. It is possible that these varieties may be the sexes of the species.

We have a branch of *Eudendrium*, given to us by our late lamented friend Mr. Howard Stewart, Sub-curator of the Royal College of Surgeons, in which a colony

of this species has built several nests. These nests were somewhat pear-shaped, the largest end being upwards, and the entrance situated laterally near the top.

The favourite habitat of most of the species of this genus is among the weeds and zoophytes that grow thickly at the water-line of buoys. Here we have often taken them in fine summer weather. But our experience induces us to believe that, when the wind raises high the waves of the sea, they seek shelter in the quiet depths of the ocean.

We, as well as Mr. Howard Stewart, have taken this species frequently at Plymouth; we have also dredged it in Oxwich Bay, Glamorganshire. Mr. Norman has sent it to us from Cullercoats, and Mr. Edward from Banff. Mr. Robertson has procured some fine specimens at Cumbrae, and the late Mr. Barlee took it near Penzance.

The near resemblance of this species to *Podocerus validus* of Dana, demonstrates, as we have previously noticed, the close resemblance between the European and South American Crustacea.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



PODOCERUS VARIEGATUS.

Specific character. Eyes small, oblong. Second pair of gnathopoda having the propodos large, ovate ; palm oblique, fringed with a few plumose cilia. Dactylos serrated.

Length $\frac{7}{20}$ inch.

Podocerus variegatus. LEACH, Edin. Encyc. vii. p. 433. Linn. Trans. xi. p. 361. Suppl. Enc. Brit. i. 426. SAMOUELLE, Ent. Comp. p. 104. DESMAREST, Consid. sur Crust. p. 269. MILNE EDWARDS, Ann. des Sci. Nat. t. xx. p. 384. Règne Animal, pl. lxi. fig. 4. (Edit. Crochard, from Leach's type.) Hist. des Crust. t. iii. p. 63. SPENCE BATE, Rep. Brit. Assoc. 1855. Ann. Nat. Hist. 2 ser. xix. p. 148. Cat. Amph. Brit. Mus. p. 254, pl. xliii. fig. 10. WHITE, Pop. Hist. Brit. Crust. p. 197. GOSSE, Mar. Zool. i. p. 141.

THE back is perfectly smooth.* The eyes are small,

* Prof. Milne Edwards in his Crochard Edition of the "Règne Animal," has represented the first two segments of the tail postero-dorsally produced into

oblong in form, and placed in a very advanced position on the lateral lobes of the head. The superior antennæ are about one-third the length of the animal, and have a jointed flagellum, but little longer than the last joint of the peduncle, and furnished with a secondary appendage consisting of but a single articulus; the second joint of the peduncle is furnished with about twelve, and the third joint with ten, setose serrations on the under side. The inferior antennæ are scarcely longer than the superior, and the flagellum is not so long as the last joint of the peduncle, and consists of four or five large articuli; the last three, besides having numerous hairs, some of which are slightly fringed with cilia, are armed with spines that assume an increasingly hooked condition as they approach the extremity of the appendage; these are evidently powerful organs, and much used in climbing, as observed by the late Dr. Leach. The first pair of legs have the hand ovate and tapering, the finger serrated. The second pair have the hand very large, oval in form, except the palm, which is slightly excavated, and furnished with a few plumose hairs; the finger is slightly serrated upon the inner margin. The coxa of the first pair of legs is much advanced anteriorly, but not very deep, those of the three next succeeding pairs increase gradually in depth, and are each about the depth of its respective segment; the coxa of the fifth pair is not so deep as the preceding, and subequally divided into two lobes. The fifth pair of legs are not longer than the fourth; the sixth and seventh pairs are longer, and all are very robust. The posterior pair of caudal

teeth. Although we have no doubt but that the error arises from a misconception of the artist, yet being in so extensively circulated a work it is liable to mislead if not noticed.

appendages have the outer ramus terminating in three strong hooks, the inner is foliaceous.

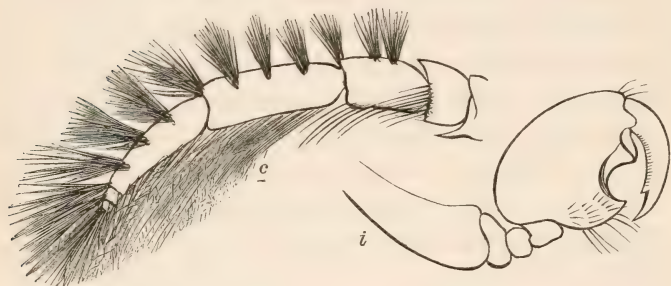
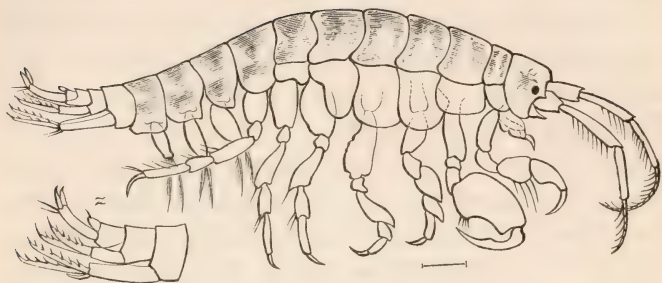
The animal derives its specific name from its beautiful colour, having "the body, legs, and antennæ beautifully variegated with red;"* but this variegated appearance is common to several species.

Dr. Leach found his specimen, which he gave as the type of the genus, on the south coast of Devon. We have taken specimens of it at Plymouth; and some were sent to the British Museum, by Mr. Stevenson, from Bell Rock, during the period that he was erecting that lighthouse. We have received from Mr. E. W. H. Holdsworth, a branch of *Tubularia gracilis*, the twigs of which are thickly covered with the tubular nests of this species; it was found upon rocks on the sea coast of Devonshire. The Rev. A. M. Norman has dredged it in forty fathoms of water one mile north of Whalsey Lighthouse. Mr. Edward has sent it to us from Banff, and Mr. Loughrin from Polperro.

* Leach.

AMPHIPODA.
NATATORIA.

PODOCERI DES



PODOCERUS CAPILLATUS.

Specific character. Eyes round. Antennæ subequal, plumose. Second pair of gnathopoda having the propodus ovate except where the palm is deeply excavated and defined by a strong tooth.

Length $\frac{1}{4}$ inch.

Podocerus capillatus. RATHKE, Nov. Act. Acad. Leop. xx. pl. iv. fig. 8.
SPENCE BATE, Cat. Amph. Brit. Mus. p. 255,
pl. xlv. fig. 3.

Jassa capillata. BRUZELIUS, Skand. Amph. Gamm. p. 19.

THIS species so much resembles *P. variegatus* that we originally considered them to be varieties of one species. Our figure, unfortunately drawn from an imperfectly-developed specimen, scarcely gives a correct idea of the points which distinguish this species; the details, how-

ever, having been taken from one in a more perfect condition, will compensate for the circumstance. It may be readily detected by the plumose antennæ (which are so thickly furnished with hair, each hair being so thickly furred with fine cilia that the antennæ resemble a brush in appearance rather than the normal organs supporting hairs) and the second pair of hands, which are ovate, with the palm deeply excavated on the infero-anterior margin, the excavation being defined at its posterior limits by an obtuse but prominent tooth, as shown in the outline figure, marked *i*.

This species is beautifully variegated and builds its nests in a very bird-like manner in submarine forests; the nest consists chiefly of fine thread-like material, woven and interlaced, being established firmly in the branches of *Zoophytes*; some small extraneous fragments are often bound in with it, but these appear more the result of accident than of intention, as is the case with *Amphithoë*. The form of the nest is somewhat oval, the entrance being invariably at the top. These nests are evidently used as a place of refuge and security, and in which the parent protects and keeps her brood of young until they are old enough to be independent of the mother's care.

Our vignette is taken from a group of these nests one of which upon being opened was found to be occupied by a parent animal and a swarm of young, evidently of two ages, therefore two broods,* demonstrating, we think,

* We have observed in *Atylus carinatus* from the Arctic Seas, that the young, while yet nurtured in the incubatory pouch, attain progressive stages of development. At first the head is without a rostrum, and the body and tail without dorsal teeth; these are afterwards gradually developed, and the flagella are added to the antennæ articulus by articulus. Figures of this interesting development are given in the Catalogue of Amphipoda for the British Museum.

tolerably clearly that the instinct of maternal love hovers over the young long after they are born.*

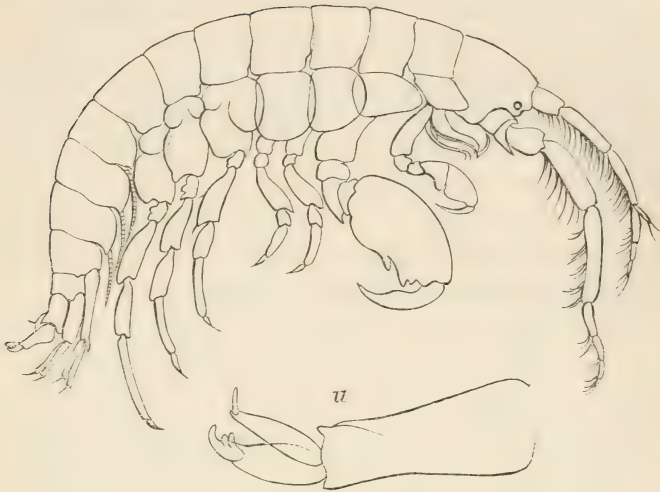
We have obtained the species from trawlers off Plymouth. Mr. Loughrin has sent it us, with their nests built in *Plumularia*, from Polperro, from which our vignette was drawn. Mr. Edward has sent it to us also, with nests built in *Corallina officinalis*, taken from rock pools near Banff; and the Rev. A. M. Norman has dredged it in from two to five fathoms in Outer Skerries Harbour, Shetlands, as well as one mile north of Whalsey Lighthouse in forty fathoms of water. Bruzelius records it from the coasts of Norway and Bohusia.

* In a note to the Translation of Mr. Spence Bate's Paper on the "Nidification of Crustacea," reprinted from the Ann. Nat. Hist. Feb. 1858, into the Annales des Sciences Naturelles, the editor objects to the word "nests" as applied to these abodes of Crustacea, but the fact that the young are therein nurtured and protected justifies us in continuing the term first used.



AMPHIPODA.
NATATORIA.

GAMMARIDES.



PODOCERUS FALCATUS.

Specific character. Inferior antennæ longer than the superior. Second pair of gnathopoda having the propodos ovate, palm very oblique, imperfectly defined, and armed with two obtuse teeth.

Length $\frac{7}{50}$ inch.

Cancer Gammarus falcatus. MONTAGU, Linn. Trans. ix. p. 100, pl. v. fig. 2.

Cerapus pelagicus (pars). MILNE EDWARDS, Hist. des Crust. t. iii. p. 61.

Podocerus falcatus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 255, pl. xlv. fig. 1.

Jassa falcata. WHITE, Pop. Hist. Brit. Crust. p. 198. LEACH, Linn. Trans. xi. p. 361. Edin. Encyc. vii. p. 433.

Cerapus falcatus. THOMPSON, Ann. Nat. Hist. xx. p. 244.

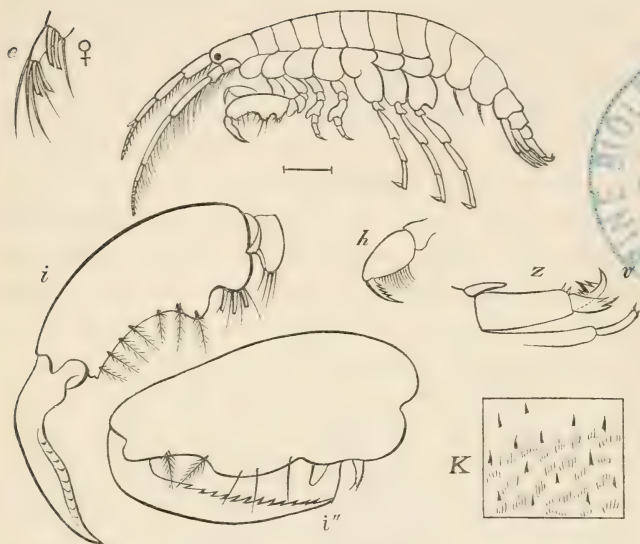
THIS species may readily be distinguished from the preceding by the greater length of the inferior pair of antennæ, which are nearly as long as the body of the animal. The second pair of hands are large and ovate, having the palm scarcely defined, but armed with two powerful but rather blunt teeth, the one situated near

the centre, the other at the anterior extremity of the palm. It is variegated in its colouring, being, according to Montagu, crimson, or mottled with a mixture of white.

Montagu, whose type specimens are in the British Museum, took it only with a dredge at Torcross, on the south coast of Devonshire. We have dredged it at Plymouth, and on the south coast of Wales; and received it from Polperro from Mr. Loughrin, and from Falmouth as well as Tenby from Mr. W. Webster, and Mr. Robertson has sent it to us from Cambræ, N. B.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



PODOCERUS PELAGICUS.

Specific character. Second pair of gnathopoda having the propodos with the palm lunately excavate, lobed near the base, and defined by two or three stiff, short, blunt spines.

Length $\frac{1}{4}$ inch.

Jassa pelagica,

LEACH, Linn. Trans. xi. p. 361. Edin. Ency. vii. p. 433. DESMAREST, Consid. sur Crust. p. 270. WHITE, Cat. Brit. Crust. p. 54. Pop. Hist. Brit. Crust. p. 198.

Podocerus pelagicus.

SPENCE BATE, Cat. Amph. Brit. Mus. p. 255, pl. xlv. fig. 2.

Cerapus pelagicus (pars).

MILNE EDWARDS, Hist. Crust. iii. p. 61. CUVIER, Règne An. (Ed. Croch.) pl. 61, fig. 2 (from Leach's type in British Museum).

THE eyes are round; and the superior antennæ are not so long as the inferior which are not quite half the length of the animal. The second pair of hands are

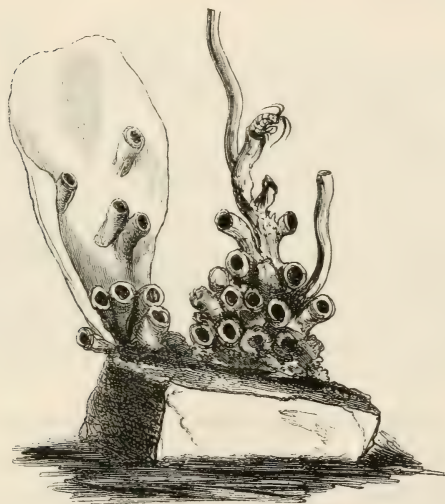
sublunate, the palm running parallel nearly the entire length of the hand, and fringed with several equidistant plumose hairs; a projecting lobe is situated near the base of the palm, which is defined by a prominence covered with a few hairs, and short stiff spines subapically tipped with a single cilium: the finger is slightly serrated along the interior margin. In a specimen received from Ilfracombe, from which the figure was drawn, the hand has undergone a considerable variation, the lunate portion is very much shortened, whereas the two lobes at the base are very much widened, though not more prominent. The finger likewise has undergone a change, being, in the typical form, somewhat dilated near the centre of the inner margin, corresponding with the concavity of the palm, whereas in the Ilfracombe variety there is no dilatation, it is also more strongly serrated; but this variation in the finger is evidently an adaptation to, and dependent upon, the form of the palm.

There is little in the structure of this species worthy of attention as differing from the preceding. The surface of the integument is covered with numerous minute points, and more thickly covered by exquisitely fine down, which appears to be arranged in uneven rows as shown at figure *K*.

This species appears to live in deeper water, or not so near the surface as the preceding, and to build its nests chiefly of mud. These nests, when broken up and examined by the microscope, do not exhibit any of that threadlike material which exists so abundantly in the others.

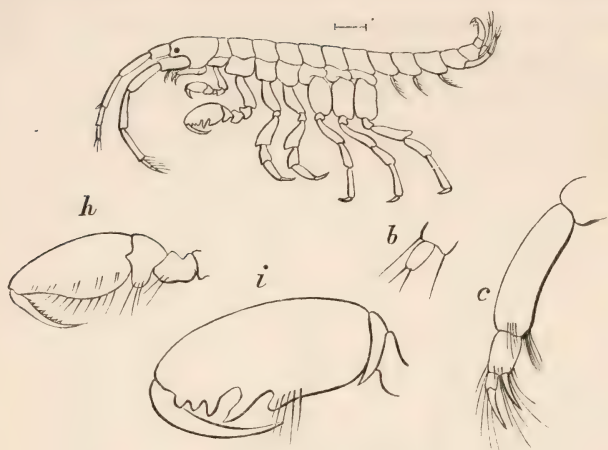
Our figure and description are taken from specimens sent to us by Mr. Gosse, who procured them at Tenby

and Ilfracombe. The vignette beneath represents the nests of this species from both localities. Those grouped round the *Tubularia* are from the former place, while those upon the *Ulva* are from the latter. The Rev. A. M. Norman and Mr. Jeffreys have dredged it also in from two to five fathoms of water in the Outer Skerries Harbour, Shetlands.



AMPHIPODA.
NATATORIA.

PODOCERIDES.



PODOCERUS OCIUS.

Specific character. Second pair of gnathopoda having the propodos long-ovate; palm very oblique, defined by an obtuse tooth, and armed with one strong central tooth and three subapical tubercles.

Length $\frac{3}{20}$ inch.

Podocerus Ocius. SPENCE BATE, Cat. Amph. Brit. Mus. p. 257, pl. xlv. fig. 5.

THIS species scarcely differs from *P. pelagicus*. It has the coxæ less deep than in any of the previously-described species. The inferior antennæ have the flagellum consisting of three articuli, the first of which is as long as the last joint of the peduncle, the second and third are each abruptly smaller, and furnished with a single strong, curved, sharp spine amidst fine hairs. The second pair of hands are long-ovate, the palm being horizontal and about half the length of the hand, defined by a strong blunt tooth, and armed near the centre with a long obliquely-pointed tooth, beyond which are three tubercles. The finger is smooth upon the inner

margin, a somewhat unusual circumstance, especially as the finger of the first pair of hands is serrated.

We found this little species in a collection which Mr. Gosse sent to us. It was taken by him at Ilfracombe, near low-water mark, spring-tide, associated with *P. pelagicus*.

The following is a sketch of Ilfracombe, showing the Lantern House and Hillsborough.



ILFRACOMBE.—LANTERN HOUSE AND HILLSBOROUGH.

AMPHIPODA
NATATORIA.

PODOCERIDES.

Genus—CERAPUS.

- Cerapus.* SAY, Journ. Acad. Philad. i. p. 49. DESMAREST, Consid. sur Crust. p. 271. MILNE EDWARDS, Ann. des Sci. Nat. xx. p. 382. TEMPLETON, Trans. Ent. Soc. i. p. 188. WHITE, Pop. Hist. Brit. Crust. p. 189. GOSSE, Mar. Zool. i. p. 140. SPENCE BATE, Cat. Amph. Brit. Mus. p. 262.
- Erichthonius.* MILNE EDWARDS, Ann. des Sci. Nat. t. xx. p. 383. Hist. des Crust. t. iii. p. 59. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 149. WHITE, Pop. Hist. Brit. Crust. p. 196.
- Cerapodina.* MILNE EDWARDS, Hist. des Crust. iii. p. 62.
- Pyctilus.* DANA, United States' Explor. Exped. p. 973.

Generic character. Body not laterally compressed. Coxæ not so deep as their respective segments of the body. Antennæ subequal: superior pair furnished with a secondary appendage; inferior antennæ having the flagellum multi-articulate. First pair of gnathopoda subchelate: second pair of gnathopoda large, complexly subchelate. Posterior pair of pleopoda unibranchied. Telson rudimentary, supporting numerous small, sharp points.

IN this genus the body of the animal is not deep or laterally compressed. The antennæ are nearly of the same length, although the lower are the more powerful pair of organs. The flagella are multi-articulate. The first pair of hands are simply subchelate; the second pair have the wrist largely developed and inferiorly produced so as to antagonize at its extremity with the apex of the finger. All the walking legs have the thighs equally dilated. The posterior pair of caudal appendages are single-branched, and the middle piece is bilobed, each lobe being studded with minute, sharp, anteriorly-directed teeth.

Say, in his character of the genus, described the flagella to the antennæ as consisting of a single joint, a mode of expression not unusual among authors. Milne Edwards consequently established his genera *Erichthonius* and *Cerapodina* in consequence of the antennæ terminating in multi-articulate flagella. The former was founded upon an animal examined by the author, the latter upon Templeton's inaccurate figure of *Cerapus abditus*. Professor Dana has likewise founded his genus *Pyctilus* upon a misconception of the figure of *Erichthonius difformis*, illustrative of M. Edward's description of that genus, which the artist has drawn with the coxa of the first pair of legs fused with the body of the animal, a circumstance not alluded to in the author's description, and one that Professor Milne Edwards informs us was an error of his draughtsman. It is for these reasons that we are led to consider that these several genera are, together with *Dercothoë*,* only synonyms of *Cerapus*.

The species of this genus are not very numerous, but they have a tolerably wide geographical range. They exist mostly in the warm temperate zones. The form of their abodes appears from Say and Templeton to be membraneous tubes; the former states them to be unattached to any substance, and carried by the free will of the animal as it swims or walks about—a fact which has not been corroborated by any subsequent observer. Mr. Stimpson, in his "Marine Invertebrata of Grand Manan," p. 47, writing of *Cerapus rubricornis*, says, "it inhabits flexible tubes, of sizes corresponding to that of the individuals, composed of fine mud and some animal cement by which it is agglutinated. These tubes are generally adherent for about one-half the length and closed below. They are usually found in large groups

* *Vide* page 459.

attached to submarine objects and to each other. The animals are very active, protruding and retracting the anterior portion of their bodies, while their antennæ are in continual motion, lashing about in search of some object which might serve for food. It is very amusing to watch a colony of these animals, with their comical gestures in their disputes with each other, and their awkward celerity in regaining their respective tubes after having left them on temporary excursions. I have in no instance met with an individual transporting a free tube, as is said by Mr. Say to be the case with *C. tubularis*."

AMPHIPODA.
NATATORIA.

PODOCERIDES.



CERAPUS ABDITUS.

Specific character. Eyes transversely ovate. Antennæ subequal. Epistoma produced to a point. Second pair of gnathopoda having the subapical process of the carpus double-pointed.

Length about $\frac{1}{2}$ inch.

- | | |
|--------------------------------|---|
| <i>Cerapus abditus.</i> | TEMPLETON, Trans. Ent. Soc. i. p. 188, pl. xx. fig. 5. |
| | SPENCE BATE, Cat. Amph. Brit. Mus. p. 263, pl. xlv. fig. 2. |
| <i>Cerapodina abditus.</i> | MILNE EDWARDS, Hist. des Crust. t. iii. p. 62. |
| <i>Erichthonius difformis.</i> | SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 149. |
| | WHITE, Hist. Brit. Crust. p. 196 (not Edwards). |

THE eyes are oval, placed longitudinally in the head, and red in colour.* The superior antennæ (broken off in the specimen drawn above) are about the same length as the inferior. The epistoma projects anteriorly in the

* Templeton gives the colour of the eyes of his specimen as black, with a pale encircling ring.

form of a long point or process as shown at *. The first pair of legs have the hand and wrist continuously oval. The second pair have the wrist as broad again and much longer than the hand, the subapical process is double-pointed; the hand has the inferior margin irregularly waved, but running subparallel with the superior. The finger is lanceolate, but slightly curved, and sparingly fringed with hairs. The first three pairs of legs are shorter than the last two, the thighs being equally dilated. The posterior pair of caudal appendages are very robust; the short single branch is tipped with short, slightly-curved, obtuse spines, the middle tail-piece having several rows of minute sharp teeth upon each lobe. The colour of the animal is pale yellow or horny, slightly studded with black spots.

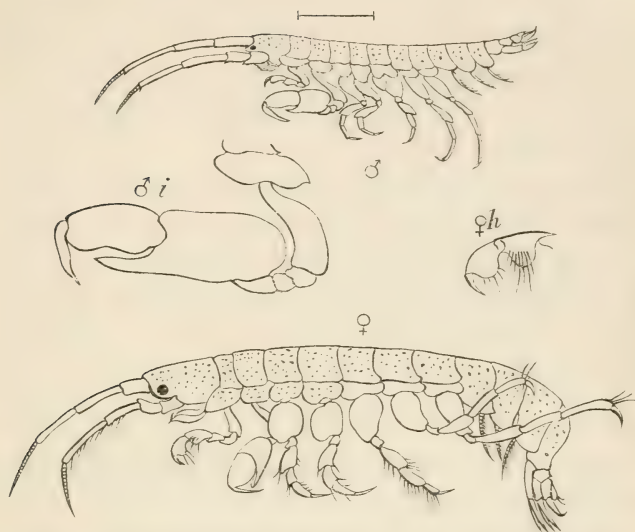
We took our first British specimens in Oxwich Bay, on the coast of South Wales, and have since taken it in Plymouth Sound, in company with the late Mr. Howard Stewart. The Rev. A. M. Norman has sent it to us from the coast of Northumberland; but the original specimen of the species was taken by Mr. Templeton in the Atlantic Ocean.

Dana describes, under the name of *Pyctilus Brasiliensis*, a specimen which agrees with our British form; and it is not impossible, since Templeton's sea voyage was from the southern to the northern hemisphere, that his species may have been taken off the coast of Brazil, and therefore identical with Dana's species; at all events this forms another evidence of the great resemblance between the British and South American Crustacea.

We have never taken this species within its abode; but Templeton figures the cell in the form of a long, narrow, membraneous tube, about one-fifth of an inch in length, his specimen being about one-eighth.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



CERAPUS DIFFORMIS.

Specific character. Male.—Antennæ subequal. Second pair of gnathopoda having the carpus longer than the propodos, and the extremity of the infero-anterior process single-pointed.

Length $\frac{7}{20}$ inch.

Female.—Second pair of gnathopoda with the wrist rather broader but not longer than the propodos, having the infero-anterior angle wide, and slightly produced as a plate along the inferior margin of the propodos.

Length $\frac{3}{20}$ inch.

Erichthonius difformis. MILNE EDWARDS, Ann. des Sc. Nat. t. xx. p. 382.
Hist. des Crust. t. iii. p. 60, pl. xxix. fig. 12.

Cerapus difformis. SPENCE BATE, Cat. Amph. Brit. Mus. p. 265, pl. xlv.
fig. 5.

THE male of this species bears a general resemblance to the preceding. The eyes are round, small, and black. The superior antennæ are rather more than half the length of the animal. The inferior antennæ are nearly as long as the superior. The first pair of legs are small,

with the wrist as deeply dilated as the hand, and nearly of the same form. The second pair have the wrist longer than, and nearly twice the breadth of, the hand; the antero-inferior process produced to a single point; the hand having the inferior margin smooth, and nearly parallel with the superior; the finger is slightly curved and pointed.

The female differs from the male in being a less slender animal: and in having the second pair of legs with the wrist not longer than the hand, and produced beneath its inferior surface, not as a strong tooth-like process, but as a thin plate-like projection. The hand is nearly round, or broadly oval, being as wide as the wrist. It is in fact a perfect specimen of the supposed genus *Dercothoë*.

Both male and female specimens are thickly sprinkled with small spots of black.

We have only seen dead individuals of this species, and have, therefore, no positive proof that the two forms above described are the male and female of the same species. We, however, received them at the same time from the same locality, and our opinion has since received a curious corroboration in the circumstance that, among the specimens sent to us, for examination, by the Rev. A. M. Norman, one had the right hand of the second pair of legs developed like that of the male, while the one upon the left side assumed all the characteristics of the female organ.

We have received specimens of this species from Banff, sent to us by Mr. Edward; from Northumberland, where it was procured by the Rev. A. M. Norman; and it is recorded by Prof. Milne Edwards as having been found on the coast of Brittany.

AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—DERCOTHÖË (CERAPUS ♀).

Dercothöë. DANA, United States' Explor. Exped. p. 968.
Dercothöë (Cerapus ♀). SPENCE BATE, Cat. Amph. p. 259.

Generic character. Eyes situated on very advanced lobes. Superior antennæ furnished with a small secondary appendage. Coxæ moderately deep. Posterior pair of pleopoda single-branched. Telson armed with several rows of small tooth-like processes.

THE eyes are situated on advanced lateral lobes. The antennæ are nearly of the same length; the superior pair furnished with a small secondary appendage. The coxæ are moderately deep. The first pair of hands are small; the second large, having the wrist produced along the inferior margin of the hand. In all other respects the animals that constitute this genus closely resemble those of the males of *Cerapus*.

The absence of positive evidence alone precludes us from suppressing this genus founded by Dana. We have little doubt but that the animals of which it consists are the females of *Cerapus*. But since we have not been able yet to determine with certainty the males of certain species, and from Dana having described one of his as having a secondary appendage to the superior antennæ that consists of three or four articuli, we think it both desirable and convenient to retain it for the present.

Kröyer—writing upon the genus *Erichthonius*, of Edwards,* which we consider to be a synonym of *Cerapus*—

* Nat. Tidsk. iv. p. 163.

states it to be the male of *Podocerus*. The general resemblance of this genus to *Podocerus* is very considerable, as may be seen by our figure of *D. punctatus*, which was first described as belonging to the genus *Podocerus*. We have, therefore, little doubt but that Kröyer, while he distinguished the true relationship existing between *Cerapus* and *Dercothoë*, was misled, from the resemblance of the latter to *Podocerus*, to consider that genus as being the female of *Cerapus*.

Stimpson, in his descriptions of *Cerapi* in his "Marine Invertebrata of Grand Manan," appears to have been aware, both of the distinction and relationship between the male and female of the genus *Cerapus*, without having fully appreciated its important bearing in relation to the observations of Dana and Kröyer.

AMPHIPODA.
NATATORIA.

GAMMARIDES.



DERCOTHOË (CERAPUS ♀) PUNCTATUS.

Specific character. Eyes round. Antennæ subequal. Second pair of gnathopoda with the carpus and propodos continuous, long-ovate; carpus but slightly produced upon the inferior margin of the propodos. Telson double-lobed.

Length $\frac{7}{20}$ inch.

Dercothoë (Cerapus ♀) punctatus. MILNE EDWARDS, MS. in Brit. Mus.
SPENCE BATE, Cat. Amph. Brit. Mus.
p. 260, pl. xlv. fig. 10.

Podocerus punctatus ♀. SPENCE BATE, Ann. Nat. Hist. 2 ser.
xix. p. 148.

THE eyes are round and black. Antennæ about one-third the length of the animal. The first pair of legs have the hand and wrist forming a continuous oval, of which the upper margin is the more rounded. The second pair of hands are larger and longer than the first; the wrist is continuous with the hand, but only about

half its length, and but slightly produced upon the inferior margin; together they form a long oval, having the palm not defined; the finger is finely crenulated along the inner margin. The coxæ are not deep except in the fifth pair of legs, which, in the specimen from which our figure is taken, are deeper than the preceding,—an unusual, and we believe an accidental or abnormal occurrence. The thighs of the five pairs of walking legs are broadly dilated, pear-shaped, the distal part being the broadest. The caudal appendages have the margins of the branches minutely serrated and armed with a few small spines; the posterior pair are very strong, unbranched, and tipped with two or three short, hook-like spines. The middle tail-piece consists of two lobes, each being armed with several rows of short sharp teeth, one lobe being represented at the upper part of figure *v*.

This animal is of a yellow or straw colour, beautifully marked with fine pigment cells, which appear to be most abundant on the coxæ and along the margins of the segments of the body of the animal.

We have placed this species in Dana's genus because we have not had proof of its actual relationship to *Cerapus*. We, however, have scarcely any doubt in considering it as being the female of *Cerapus abditus*, especially as Mr. Alder, who sent the specimen to us, stated that it was the inhabitant of a tube, and as its sex is indicated by the eggs seen in its egg-pouch.

We received this specimen, from which our description and figure are taken, from Mr. Alder, who dredged it on the coast of Northumberland; and we have a drawing of a specimen that we took with a dredger some years since in Oxwich Bay, on the coast of Glamorgan, which we believe to be identical.

AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—SIPHONÆCETES.

Siphonæcetus. KROYER, Nat. Tidsk. i. p. 491. Voyage en Scand. pl. xx. fig. 1. SPENCE BATE, Cat. Amph. Brit. Mus. p. 268. Ann. Nat. Hist. 2 ser. xix. p. 149. Rep. Brit. Assoc. 1855, p. 59. WHITE, Pop. Hist. Brit. Crust. p. 196.

Generic character. Superior antennæ with a multi-articulate flagellum, and no secondary appendage. Inferior antennæ having the flagellum not multi-articulate. Gnathopoda subequal, subchelate. Pereiopoda short and robust. Posterior pair of pleopoda very short, terminating in a single ramus tipped with hooks. Telson furnished with several rows of short, sharp teeth or spines.

THE body of the animals in this genus is not laterally compressed, and the coxæ are very small. The eyes are situated on projecting lateral lobes of the cephalon. The superior antennæ are shorter than the inferior, and are furnished with a multi-articulate flagellum, but do not carry a secondary appendage. The inferior antennæ are developed nearly in the form of true legs, and generally consist, we believe, of seven joints; at all events the flagellum is never multi-articulate. The first two pairs of legs are subchelate, and nearly alike in size, the second being rather the larger. All the walking legs are short and tolerably strong. The posterior pair of caudal appendages terminate in a double-hooked branch. The middle tail-piece consists of a single lobe, furnished with numerous small teeth or spines.

Krøyer, in his figure of the type of the genus, represents the posterior pair of caudal appendages as being double-branched, but if our observation be cor-

rect, there is but a single branch, terminating in a double hook.

This genus appears to be a northern form, and one which has not been very frequently observed. The animals dwell in tube-like nests, apparently open only at one end, and generally of a very cylindrical form. The inhabitants correspond in form with their abodes, the legs being short and furnished with sharp minute fingers which enable them to progress or retire within their dwellings.

The following vignette represents some Welsh girls picking cockles off the pier-head at Swansea.

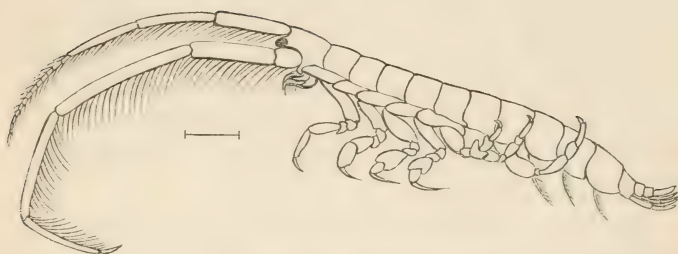


GIRLS PICKING COCKLES.

AMPHIPODA.

NATATORIA.

PODOCERIDES.



SIPHONÆCETES TYPICUS.

Specific character. Antennæ cylindrical: superior reaching to the extremity of the peduncle of the inferior: inferior antennæ nearly as long as the animal; flagellum with three joint-like articuli, the first and second greatly elongated.

Length $\frac{1}{4}$ inch.

Siphonæcetes typicus. KRÖYER, Nat. Tidsk., 2. Ser., i. p. 491, pl. vii. fig. 4. Voyage en Scand. Crust., pl. xx. fig. 1. SPENCE BATE, Cat. Amph. Brit. Mus. p. 270, pl. xlv. fig. 1 (after Krøyer).

THE eyes are round. The superior antennæ are about one-half the length of the animal. The inferior have the peduncle nearly as long as the superior antennæ; the flagellum consists of two very long and one short articuli. In Krøyer's figure of this organ the second articulus is shorter than the first, and, as well as the third or last, is furnished with a few strong, sharp, and slightly-curved spines, besides the fine hairs. The first pair of legs are slender, the wrist being as long as the hand, of which the palm is extremely oblique. The second pair are a little stouter than the first, and the hand somewhat less oblique, and more clearly defined. The first two pairs of walking legs have the thighs but moderately dilated, and the finger nearly straight. The last three are very short; and the penultimate pair of caudal appendages are as long as the ultimate.

The animal here described was taken by Mr. Jeffreys and the Rev. A. M. Norman, during the summer of 1861, in from seventy to ninety fathoms water, sixty miles east of the Shetland group. This is the first time that the animal has been described as British. In the Catalogue of Amphipoda for the British Museum, the species was indicated as Scandinavian, from Kröyer's description and figure.

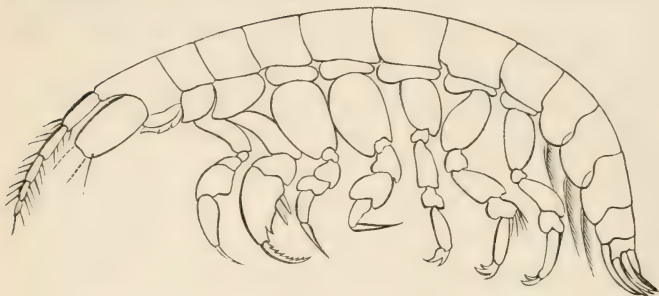
The abode constructed by this species is also figured and described by Kröyer as being built of small stones and fragments of pebbles cemented together, and open at one end only.

Never having taken the nest of this species, we are indebted to Kröyer's figure for the following vignette.



AMPHIPODA.
NATATORIA.

PODOCERIDES.



SIPHONÆCETES WHITEI.

Specific character. Superior antennæ having the peduncle but little longer than the cephalon; the flagellum short, and apparently exarticulate. Inferior antennæ Gnathopoda with the carpi and propoda continuously long-ovate; dactylos of the second pair serrated. First two pairs of pereopoda having the dactyla straight.

Length $\frac{4}{20}$ inch.

Cerapus Whitei.

GOSSE, Nat. Rambles, Devonshire, p. 383.
pl. xxii. fig. 12. Mar. Zool. p. 140, f. 253.
WHITE, Brit. Crust. p. 191.

Siphonæcetus Whitei.

SPENCE BATE, Cat. Amph. Brit. Mus. p. 270,
pl. xlv. fig. 10.

Siphonæcetus Kröyeranus.

SPENCE BATE, Ann. Nat. Hist. 2 ser. xix.
p. 149. WHITE, Hist. Brit. Crust. p. 196.

OUR knowledge of this species is limited. The specimen which we examined, and originally described as *S. Kröyeranus*, has the superior antennæ shorter than either the figures of Kröyer or of Gosse; we have, nevertheless, associated both under one name, and it is not improbable that they may prove to be females of *S. typicus*. The almost exarticulate flagellum of the upper antennæ, and the more strongly armed second pair of hands, may, possibly, be characteristics of the female sex, but until more specimens are obtained

we hesitate to give the species as identical with *S. typicus*. The antennæ are represented in Mr. Gosse's figure as being of nearly equal length, and but little more than half the length of the animal.

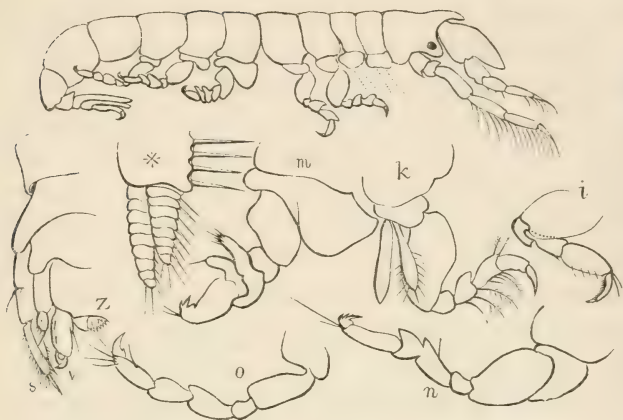
Our specimen was sent to us from Weymouth by Professor Williamson. Mr. Gosse took his in tubes attached to tufts of *Chondrus crispus* (the sea-weed that is sold in a dry state under the name of Carrageen Moss), at Ilfracombe, at low-water spring-tide mark; he has given, under the name of the Caddis Shrimp, the following account of its habits, in the work above quoted:—

“Among these (Algæ and various parasite Zoophytes), and assisting to conceal and metamorphose the plant, you may find a number of conical tubes, varying from one-sixteenth to one-eighth of an inch in length, made of a somewhat tough papery or leathery substance, of a dusky colour, and of a rough surface. They are stuck upon the fronds of the seaweed in all directions, without any order, some laid along, others standing erect, sometimes singly, sometimes associated.” “The animal in its tube much resembles the larvæ of the genus *Phryganea*, that anglers value under the name of Caddis-worms. There, however (and as in *S. typicus*), the case is composed of a mosaic of minute pebbles, bits of shells, &c., imbedded in a glutinous silk, with which the interior is smoothly lined. In our little crustacean, I do not know of what it is made, or how, but it seems to be homogeneous, and is certainly of home manufacture, and not the tube of a Zoophyte surreptitiously obtained, as has been supposed to be the case with the *Cerapus tubularis* of North America.”

It received its specific name from Mr. Gosse in compliment of his friend Mr. A. White.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



SIPHONÆCETES CRASSICORNIS ♀.

Specific character. Head produced into a rostrum. Superior antennæ having the first joint large, and supero-anteriorly produced to a porrected point. Inferior antennæ but little longer than the superior. Dactyla of the first and second pairs of pereiopoda short and slightly curved.

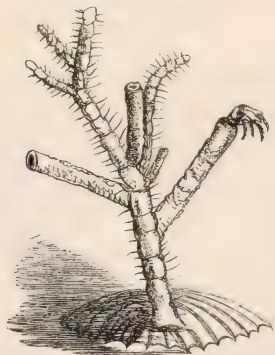
Length $\frac{1}{5}$ inch.

Siphonæcetes crassicornis. SPENCE BATE, Rep. Brit. Assoc. 1855, p. 59.
Ann. Nat. Hist. 2 ser. xix. p. 149. Cat.
Amph. Brit. Mus. p. 269, pl. xlv. fig. 9.
WHITE, Pop. Hist. Brit. Crust. p. 197.

THE only specimen which we have seen of this species is a female. It is long and flat, the head being anteriorly produced into a rostrum. The eyes are small and round. The superior antennæ are not one-fourth the length of the animal; the first joint of the peduncle is very large, and anteriorly produced, upon the upper side, to a long horn-like point, whence the specific name. The inferior antennæ are scarcely longer than the superior, and are considerably shorter than in

the typical species, a circumstance which in some measure may be due to the specimen being a female. The first pair of legs are wanting in one specimen. The second are small, having a long, oval, simple hand, and short curved finger. The third and fourth pairs of legs are short, and have the thighs dilated, and the fingers short and curved; the branchial sac is as long as the incubatory flabellum attached to the same appendage. The fifth pair of legs have the coxa broad, the thigh short, the meta-carpus and wrist short, and posteriorly dilated, considerably broader than long; the hand ovate, tapering, and the finger short, triple-pointed, and curved. The sixth pair of legs are longer than the fifth, and more simple in character, while the seventh pair are the longest and most simple. The penultimate pair of caudal appendages are the shortest; the ultimate terminating in a double-hooked branch. The middle tail-piece is of a tubercular form, and covered with numerous small sharp teeth or spines.

Dredged by Mr. Joshua Alder, on the Northumberland coast. It lives in small cylindrical mud tubes, attached to branches of *Antennularia*. Its colour appears to be yellow, blotched with patches of white.



AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—NÆNIA.

Podocarpus Wood

Nænia. SPENCE BATE, Cat. Amph. p. 271.

Generic character. Antennæ subequal; superior pair without a secondary appendage; inferior having the flagellum multi-articulate. Gnathopoda subchelate. Posterior pair of pleopoda biramous. Telson cylindrical.

THE animals of this genus are somewhat compressed. The eyes are round. The superior antennæ are about the same length as the inferior; the latter originate posteriorly to the superior, and terminate in a multi-articulate flagellum. The first two pairs of legs have subchelate hands, the second pair being much larger than the first. The walking legs are tolerably robust, and not very long. The posterior pair of caudal appendages terminate in a pair of styliform branches. The middle tail-piece is tubular, and tipped with one or two rudimentary denticles.

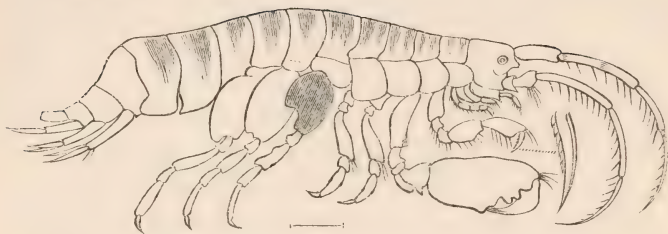
This genus bears considerable resemblance to *Eurystheus*, and it is with much hesitation that we have placed them in different families.* The species are rare, and it is not improbable, when more individuals are obtained, that some of the supposed species here described, chiefly founded on the structure of the hands, may prove only varieties of other species.

* We have not been able to identify the *Gammarus spinipes* of Dr. Johnson (Zool. Journ. iv. p. 417), taken among *Sertularia*, from deep water on the Berwickshire coast, but are inclined to refer it either to the present genus or to *Eurystheus*, the character given of the first two pairs of legs agreeing tolerably well with those of *Eurystheus bispinimanus* (ante, p. 357).

AMPHIPODA.

NATATORIA.

PODOCERIDES.



NENIA TUBERCULOSA.

Specific character. Second pair of gnathopoda having the propodos with the palm armed near the centre with a large double tubercle.

Length $\frac{1}{4}$ inch.

Nenia tuberculosa. SPENCE BATE, Cat. Amph. Brit. Mus. p. 271, pl. xlv. fig. 2.

THE body of the animal is rather long, and somewhat compressed. The eyes are round, and not large. The superior antennæ are about half the length of the animal; having the first joint of the peduncle as long as the head, the second nearly as long again, whilst the third is shorter than the first and slighter than the second; the flagellum is longer than the last two joints of the peduncle. The inferior antennæ are about the same length as the superior; the peduncle, having the last two joints of nearly equal length, reaches as far as the extremity of the peduncle of the superior; the flagellum is about the length of the last joint of the peduncle. The first pair of legs have the wrist as long as the hand; neither of these joints are much dilated; the hand is oval, with an oblique and imperfectly-defined palm; the finger is long, slight, and sharp, being deeply serrated upon the inner margin. The second pair of legs have the wrist very short, and the hand long and broad; the palm is oblique, defined by an angle, and

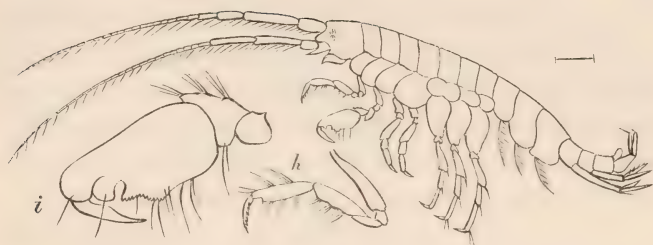
armed, near the centre, with a broad double tubercle, from which the animal derives its specific name; the finger is much curved, and not serrated upon the inner margin. The walking legs are nearly of the same length, and tolerably strong. The last pair of caudal appendages terminate in a pair of styliiform branches. The central tail-piece is tubular, the oblique extremity being furnished with a few minute denticles.

We have taken this species, not unfrequently, with the dredge off Plymouth, and in Oxwich Bay on the south coast of Wales. Mr. Webster has also sent it to us from Tenby, Mr. Edward from Banff, and Mr. Thomson procured it in Belfast Bay, Ireland.

AMPHIPODA.

NATATORIA.

PODOCERIDES.



NŒNIA RIMAPALMATA.

Specific character. Second pair of gnathopoda having the propodos with the palm deeply notched, and the margin very delicately crenulated.

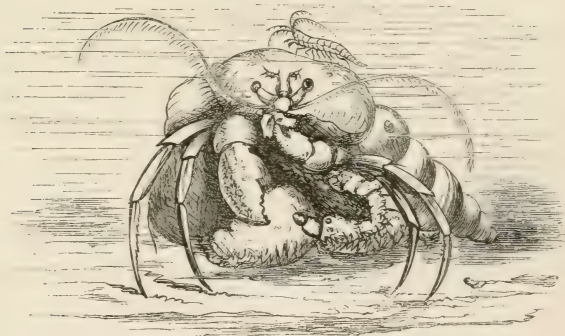
Length $\frac{1}{4}$ inch.

Nœnia rimapalma. SPENCE BATE, Cat. Amph. Brit. Mus. p. 272, pl. xlv. fig. 3.

THE eyes are round, and black; and the antennæ, which are nearly equal, are about two-thirds of the length of the animal; the inferior pair are slightly longer than the superior; the flagellum in each pair is longer than the peduncle. The first pair of legs are long and slender; the hand and the wrist being nearly of the same length, and scarcely broader than the other joints; the palm is oblique and concave; and the finger, which is longer than the palm, is sharp and distinctly serrated upon the inner margin. The second pair of legs have the wrist short; the hand long-quadrate, with the palm oblique, having near its middle a deep notch, from whence the specific name of the animal is derived; the margin of the palm is furnished with a row of small, regular, bead-like protuberances. In all other respects this species scarcely differs from the preceding.

We first received it from the coast of Northumberland, where it was taken by Mr. Joshua Alder. It has

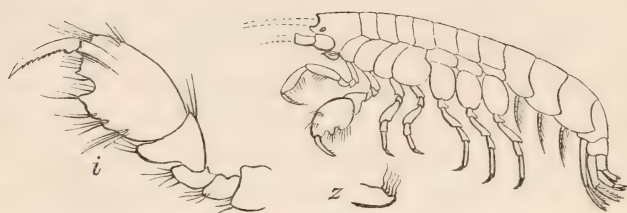
since been sent to us from Kames Bay, Cumbræ, by Mr. Robertson, who informs us that he has repeatedly found it to be the occupant of almost every *Buccinum* shell inhabited by the hermit crab. He therefore assumes, with some apparent justice, since he has never found any other species of Amphipod so associated, that the position must be one of choice, and not an accidental occurrence. We may, therefore, consider that *Nænia rimapalmata* forms one of the "happy family," spoken of by Mr. Gosse, Mr. Lubbock, and others, and exhibited in the vignette below. It has also been taken by Mr. Jeffreys and the Rev. A. M. Norman, in from seventy to ninety fathoms of water, sixty miles east of the Shetlands.



AMPHIPODA.

NATATORIA.

PODOCERIDES.



NÆNIA EXCAVATA.

Specific character. Second pair of gnathopoda having the propodos with the palm deeply excavated towards the inferior angle. Dactylos with the inner margin serrated.

Length $\frac{1}{4}$ inch.

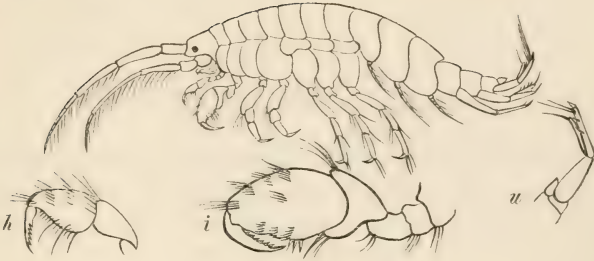
Nænia excavata. SPENCE BATE, Cat. Amph. Brit. Mus. p. 272, pl. xlvi. fig. 4.

THE antennæ of the only specimen which we have seen of this species were broken off. In all respects the animal agrees with the preceding, except in the form of the second pair of hands, which have the palm deeply and broadly excavated near the inferior angle, a circumstance which has given rise to the specific name; the finger is distinctly serrated.

We received our specimen from Mr. Alder, who procured it while dredging off the coast of Northumberland.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



NÆNIA UNDATA.

Specific character. Second pair of gnathopoda having the propodos with the palm oblique, imperfectly defined, and slightly waved.

Length $\frac{1}{4}$ inch.

Nænia undata. SPENCE BATE, Cat. Amph. Brit. Mus. p. 272, pl. xlvi. fig. 5.

THE antennæ are about half the length of the animal, the flagellum not being longer than the last joint of the peduncle. First pair of legs having the hand dilated, slightly broader than the wrist, and tapering; the palm is oblique, occupying the entire under margin, and is ciliated; the finger is distinctly serrated. The second pair of legs have the hands ovate, and the palm oblique, and undulated (whence the specific name), defined by two or three short spines, and flanked by two or three short transverse rows of cilia. In other respects this species differs little from the last.

It was sent to us by Mr. Alder, who dredged it on the coast of Northumberland.

*AMPHIPODA.**NATATORIA.**PODOCERIDES.*

Subfamily—COROPHIIDES.

Cephalon and pereion broader than deep. Inferior antennæ subpediform, more powerful than the superior. Coxæ small. Posterior pair of pleopoda subfoliaceous or styliform, not armed with spines. Telson squamiform, unarmed.

THE genera which belong to this subfamily are composed of animals in which the head and body are not laterally compressed. The coxæ are small, consequently the animals being broader than deep are capable of walking in an upright position, both in and out of the water. The inferior antennæ are stronger, and generally longer than the superior, they never terminate in a multi-articulate flagellum, but assume much of the form of a true leg, and are made use of in climbing and grasping substances. The last pair of caudal appendages are never furnished with hook-like spines, but terminate in styliform or subfoliaceous branches, which are generally very short, and in some genera rudimentary. The central tail-piece is always single, and scale-like, and is never armed with hooks or spines.

AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—CYRTOPHIUM.

- Cyrtophium*. DANA, U. S. Explor. Exped. p. 839. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 145. Cat. Amph. Brit. Mus. p. 278. WHITE, Pop. Hist. Brit. Crust. p. 195.
Platophium. DANA, U. S. Explor. Exped. p. 838.
Lætmatophylus. BRUZELIUS, Skaud Amph. Gamm. p. 11, pl. i. fig. 1.

Generic character. Cephalon subquadrate. Pereion distended. Pleon narrow. Eyes prominent. Antennæ subpediform; inferior pair the longer. Gnathopoda subchelate; second pair much larger than the first pair. Posterior pair of pleopoda rudimentary. Telson squamiform.

IN this genus the animals, when viewed from above, have the head very square, the body distended to an oval, while the tail is considerably narrowed, and generally lies inflected against the under side of the body. The eyes are prominent. The antennæ are subpediform, the flagella not being multi-articulate; and the inferior pair always longer than the superior. The first two pairs of legs have the hands subchelate, the second pair being considerably larger than the first. The last two pairs of walking legs are considerably longer than the others. The caudal appendages are successively shorter posteriorly, the last pair being quite rudimentary, and scarcely longer than the central terminal scale.

It will be perceived that we have united Dana's two genera into one, since the only distinction that the author admits between *Platophium* and *Cyrtophium* depends upon "the respective lengths of the branches belonging to the caudal appendages, the more lamellar

form of the inner ramus of each of those caudal appendages which are normally developed, and the greater length of their spines;" the fundamental character of both are, however, uniform.

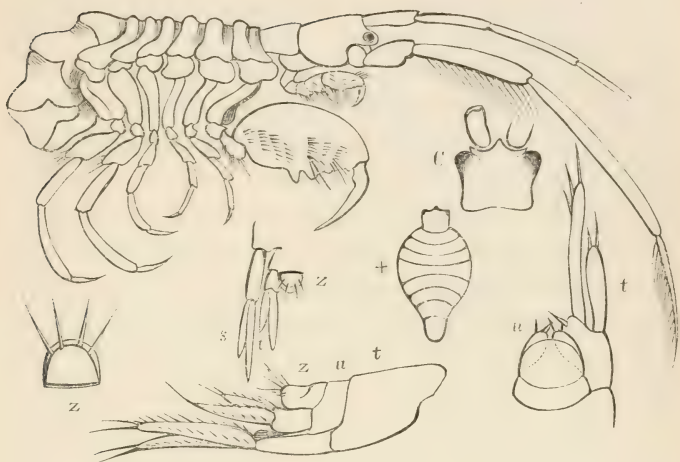
The name of *Cyrtophium* is preferred to the one which Dana more fully described, in consequence of its having been applied to an European species, previously to our having determined that the two were congeneric.

This genus will probably be found to have a large geographical range, since, although but few specimens have hitherto been found, their habitats have been widely apart.

Cyrtophium Brasiliense was dredged by Dana in the harbour of Rio Janeiro, while he took *C. orientale* at Singapore in the East Indies. *C. tuberculatus* has been dredged by Bruzelius on the coast of Norway, and the British species is not rare on the southern coast of England.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



CYRTOPHIUM DARWINII.

Specific character. Pereion imbricated. Superior antennæ not reaching beyond the peduncle of the inferior. Second pair of gnathopoda having the propodos as long as the cephalon and first two segments of the pereion. Posterior pair of pleopoda scarcely reaching beyond the extremity of the telson. Telson suborbicular, squamiform.

Length $\frac{3}{20}$ inch.

Cyrtophium Darwinii. SPENCE BATE, Rep. Brit. Assoc. 1859, p. 59. Ann. Nat. Hist. 2 ser. xix. p. 148. Cat. Amph. Brit. Mus. p. 274, pl. xlvi. fig. 8. WHITE, Pop. Hist. Brit. Crust. p. 196.

THE dorsal aspect of the head is square, with a small point anteriorly produced between the superior antennæ. The eyes are prominently situated upon each side of the anterior lateral angles. The body, seen from above (fig. *), is oval, every segment of which has the posterior half elevated into a ridge, which, viewed in a lateral aspect, gives the animal somewhat of an imbricated appearance. The tail

is very much narrower than the body, and generally lies bent up against the underside of the body of the animal. The eyes are prominent. The superior antennæ do not reach beyond the extremity of the peduncle of the inferior. The inferior antennæ are nearly as long as the animal; the last joint of the peduncle is very long, being quite as long as the three preceding; the flagellum consists of one very long and one or two minute terminal articuli. The first pair of legs have the hands a little longer than the wrist, with no defined palm, and a strong curved finger. The second pair of legs have the hands very much larger than those of the first pair, being equal in length to the head and the first two segments of the body; they are oval in form, the upper edge being more arched than the lower; the palm is crenulated, defined by a blunt tooth, and runs continuously with the inferior margin; the finger is longer than the palm, narrow, and arcuate. The thighs of the three posterior pairs of walking legs gradually increase in dilatation, and the last two pairs are very much longer than the others. The three pairs of caudal appendages have subfoliaceous branches, and decrease posteriorly in length, the last scarcely reaching beyond the extremity of the terminal scale, which overlays them, and which is circular and scale-like.

We have only as yet received specimens of this species from Mr. Webster, some of which he dredged off Falmouth, the others he obtained on the beach, at low water, at St. Michael's Mount.

Some specimens (mixed with those of the genus *Podocerus*) have long existed unrecognized in the Collection of the British Museum, procured by Dr. Leach, probably from the South Coast of Devon.

The females of this species appear to differ from the

males in having the hand of the second pair of legs smaller, and the body less compressed.

It is our opinion that *Lætmatophilus tuberculatus*, of Bruzelius, may be the female of a species of this genus in which the penultimate pair of caudal appendages have been broken off and are undergoing the process of reproduction. This suggestion is, indeed, founded only upon negative evidence; moreover, we think that we should be doing the author of the "Skandinaviens Amphipoda Gammaridea" injustice, in the present state of our information, if we were to insert his genus *Lætmatophilus* as a synonym of *Cyrtophium* of Dana, although we anticipate that they will ultimately be proved to be the same.

AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—CRATIPPUS.

Cratippus. SPENCE BATE, Cat. Amph. Brit. Mus. p. 275.

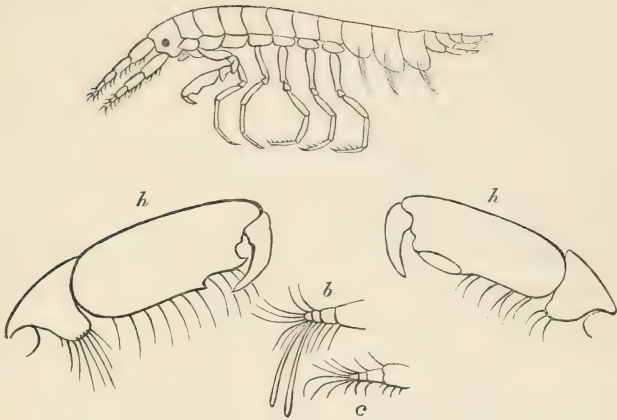
Generic character. Antennæ short, subequal; flagella rudimentary. Superior antennæ without secondary appendage. Gnathopoda subchelate. Coxæ small. Pereiopoda subequal. Three posterior pairs of Pleopoda having short terminal rami. Telson squamiform.

IN this genus the body of the animal is long and not laterally compressed. The antennæ are subequal, terminating in very short flagella: the superior pair are not furnished with a secondary appendage. The first two pairs of hands are subchelate. The walking legs are all nearly of the same length; and the three pair of caudal appendages have the terminal branches shorter than their respective peduncles. The middle tail-piece is, we believe, a flat, scale-like appendage.

This genus differs from *Corophium* in the subchelate character of the second pair of legs, and in the rudimentary condition of the flagellum of the antennæ.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



CRATIPPUS TENUIPES.

Specific character. Eyes small and round. Antennæ subequal, one-fourth the length of animal; flagella not longer than the last joint of the peduncle. Second pair of gnathopoda having the propodos narrow, not much dilated. Pereiopoda slender, moderately long. Thighs not dilated. Caudal appendages terminating in short rami.

Length $\frac{3}{20}$ inch.

Cratippus tenuipes. SPENCE BATE, Cat. Amph. Brit. Mus. p. 276, pl. xlvi. fig. 10.

THE eyes are round and black. The antennæ are not more than one-fourth of the length of the animal, and are of nearly the same length and size; the flagella of each being rudimentary, and consisting of but three articuli, each being smaller than the preceding, that of the superior differing from that of the inferior in the presence of two long auditory cilia (fig. *b*). The first pair of legs (omitted in our figure) are long, slender, and scarcely subchelate. The second pair of legs have the wrist short; the hand long, not broader than the

wrist, but three or four times as long, and with the upper and lower margins parallel; the palm is oblique, that of the right hand being developed into the form of a small cup, possibly an abnormal condition, resulting from some previous injury to the part, that of the left hand being armed with a strong tooth near the centre, and a smaller one which defines its posterior limit. The walking legs are all of the same length, being tolerably long and rather slender; they have the thighs not developed, and the penultimate joint of the last three pairs are serrated upon the inner margin. The caudal appendages are short, and each terminates in short branches.

We know nothing of the habits of this creature, of which a single specimen only has been sent to us by Mr. Edward, who took it near Banff.

The following sketch of Covesea Lighthouse, on the shores of the Moray Frith, was kindly drawn for us by Miss Gordon Cumming, of Altyre.



COVESEA LIGHTHOUSE.

AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—DRYOPE.

Dryope. SPENCE BATE, Cat. Amph. Brit. Mus. p. 276.

Unciola. GOSSE, Marine Zool. i. p. 141 (not of Say).

Generic character. Body not laterally compressed. Antennæ subequal, terminating in a multi-articulate flagellum; the superior not having a secondary appendage. Gnathopoda subchelate, first pair being larger than the second. Posterior pair of pleopoda the shortest, double-branched. Telson squamiform.

IN this genus the body of the animal is long and not compressed. The eyes are small. The antennæ are nearly of equal length, and terminate in multi-articulate flagella, but there is no secondary appendage to the superior pair. The hands of the first two pairs of legs are subchelate; the second, which is the smaller, might, indeed, perhaps be described as being imperfectly chelate. The coxæ of all the legs are small; and the caudal appendages have the branches spinous; the posterior pair are the shortest. The middle tail-piece is single and squamiform.

This genus is founded upon an animal discovered by Mr. Gosse, and supposed by him to belong to *Unciola* of Say; but this genus differs from that of *Unciola* in the absence of the secondary appendage to the superior antennæ, in the subchelate condition of the second pair of hands, and probably also in the form of the telson.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



DRYOPE IRRORATA.

Specific character. First pair of gnathopoda having the palm defined by a large tooth, and with two large obtuse lobes in its middle; the margin smooth. Dactylos imperfectly coarsely serrated. Second pair of gnathopoda having the palm concave; margin ciliated with a few fine hairs.

Length, $\frac{1}{4}$ inch.

Dryope irrorata. SPENCE BATE, Cat. Amph. Brit. Mus. p. 276, pl. xlvii. fig. 1.

Unciola irrorata. GOSSE, Mar. Zool. i. p. 141, fig. 256 (not Say).

THE body is more than half the length of the animal. The third segment of the tail has the posterior margin waved and deeply excavated above the inferior angle. The eyes are small and round. The superior antennæ are scarcely half the length of the animal, and the flagellum is not longer than the last joint of the peduncle. The inferior antennæ are scarcely shorter than the superior; the flagellum is about the same length as that of the superior pair. The first pair of legs have the wrist and hand continuous; the postero-inferior angle of the wrist is produced to a tooth. The hand is as long as the head, triangular, with the palm occupying the entire length of the inferior margin, and being defined at its posterior limit by a strong tooth,

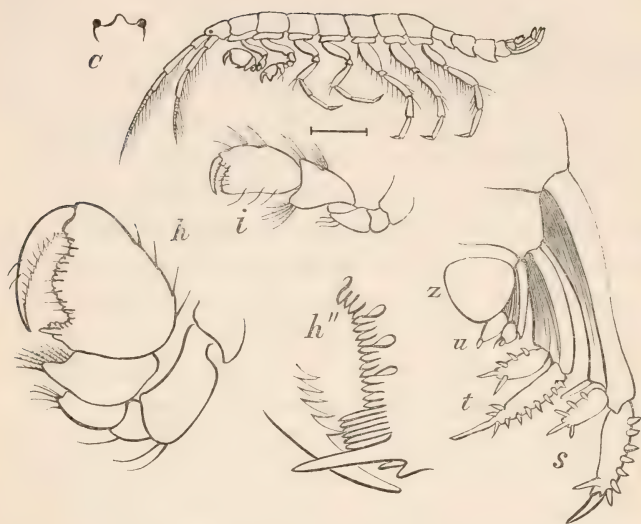
with two tubercles near its centre, and fringed with a few cilia, each extending perpendicularly from the surface; the finger is tolerably robust, and has the inner margin imperfectly serrated. The second pair of legs have the hand much smaller than that of the first, and not so much dilated, having the superior and inferior margins parallel, both being fringed with fasciculi of hairs; the palm is concave, and the inferior angle is produced anteriorly as far as the superior angle; it is also marginate, the edge being crenulated, a fine cilia surmounting the points between every indentation. The last three pairs of walking legs are about equal in length and sparingly ciliated. The caudal appendages are short, reaching scarcely beyond the telson.

This species was taken by Mr. Gosse at Weymouth; and the specimen having been kindly presented to us, we are enabled to give a figure and description from the same animal, which he had previously described as *Unciola irrorata*.



AMPHIPODA.
NATATORIA.

PODOCERIDES.



DRYOPE CRENATIPALMATA.

Specific character. Propodos of the first pair of gnathopoda having the palm minutely crenulated; propodos of the second pair of gnathopoda having the palm concave and ornately pectinated.

Length $\frac{3}{20}$ inch.

Dryope crenatipalma. SPENCE BATE, Cat. Amph. Brit. Mus. p. 277, pl. xlvii. fig. 2.

THE head of this species has a slight point produced between the superior antennæ. The eyes are round and situated at the extreme anterior angles of the head. The superior antennæ are about half the length of the animal; the flagellum is as long as the second and third joints of the peduncle. The inferior antennæ are shorter than the superior; the peduncle being as long as the peduncle of the superior; the flagellum is not longer than the last joint of the peduncle. The first

pair of legs have the hand subtriangular; the superior margin is arcuate, but not continuous with that of the wrist; the palm occupies nearly the entire length of the inferior margin, it is very oblique, irregularly waved, minutely crenulate, and defined by a prominent tubercle or blunt tooth, tipped with a strong spine; the finger is as long as the palm, having the inner margin serrated, except at the apex. The second pair of legs have the hand nearly twice as broad as long, with the upper and lower margins subparallel; the inferior angle produced; the palm concave, having the deepest part near the finger ornately pectinated; near the articulation of the finger there are several simple sharp-pointed perpendicular teeth, succeeded by two or three lobes or tubercles, surmounted with four teeth that spread on each side like a fan, and lastly, with seven or eight long, comb-like teeth, just within the limits of the inferior angle of the palm, the last but one of which is twice the length and size of the others (fig. *h''*). The finger is strongly serrated upon the inner margin. The last three pairs of walking legs have the antero-distal extremities lobed, and the fingers robust and curved. The caudal appendages decrease posteriorly in length; the branches are shorter than the peduncle, slightly spinous, a long apical spine tipping every branch, of which the upper or outer is the longer in the ante- and penultimate pairs, but the inner one is the longest in the ultimate. The tail-piece is circular, with a small point at the dorsal extremity.

This species was sent to us by Mr. Gosse, who took it off Weymouth.

AMPHIPODA.
NATATORIA.

PODOCERIDES.

Genus—COROPHIUM.

Corophium. LATREILLE, Gen. Crust. et Ins. i. p. 58. LEACH, Edin. Ency. vii. p. 403. LINN. Trans. xi. p. 362. DESMAREST, Cons. sur les Crust. p. 270. WHITE, Pop. Hist. Crust. p. 193. BRUZELIUS, Skand. Amph. Gam. p. 14. GOSSE, Mar. Zool. i. p. 141. SPENCE BATE, Ann. Nat. Hist. 2 ser. xix. p. 149. Cat. Amph. Brit. Mus. p. 279.

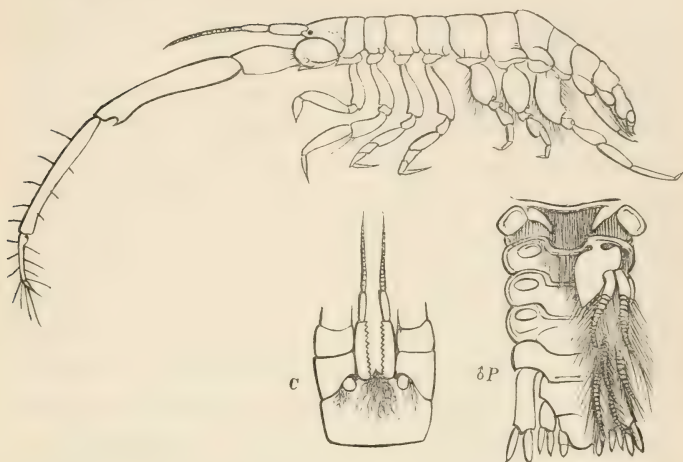
Generic character. Pereion not compressed. Eyes small. Superior antennæ terminating in a multiarticulate flagellum. Inferior antennæ very large, subpediform, terminating in a flagellum destitute of articuli. First pair of gnathopoda subchelate; second pair not subcheliform. Posterior pair of pleopoda terminating in a single branch. Telson squamiform.

IN this genus the body of the animal is not compressed. The eyes are small. The superior antennæ are shorter than the inferior, and terminate in a multiarticulate flagellum. The inferior antennæ are longer and much more powerful than the upper, particularly in the male. The coxæ are very small. The first pair of gnathopoda are subchelate; the second are slender in the male, but somewhat more robust in the other sex. The last pair of legs are much longer than the others. The caudal appendages are very short, the last being the shortest, and terminating in a single branch. The central tail-plate is scale-like and single.

This genus appears to be confined to the Northern Hemisphere—a doubtful, but nearly-allied, species (*C. quadriceps*) taken at Rio Janeiro, by Dana, being the only representative yet known from the southern seas.

AMPHIPODA.
NATATORIA.

PODOCERIDES.



COROPHIUM LONGICORNE.

Specific character. Superior antennæ having the inner margin of the first joint of the peduncle minutely crenulated. The inferior antennæ longer than the animal in the male; the penultimate joint of the peduncle armed near the distal extremity with a tooth upon the inferior surface; flagellum about half the length of the last joint of the peduncle, biarticulate.

Length $\frac{1}{3}$ of an inch.

Corophium longicorne. LATREILLE, Gen. Crust. et Ins. i. p. 59. LAMARCK, Hist. des Anim. sans Vert. v. p. 184. LEACH, Edin. Encyc. vii. p. 403. Linn. Trans. xi. p. 362. Suppl. Ency. Brit. i. p. 426. SAMOUELLE, Ent. Comp. p. 105. DESMAREST, Consid. sur Crust. p. 270, pl. xlv. fig. 1. BREBISSE, Cat. des Crust. recueillis dans le Dep. du Calvados, 1825, p. 252. GUERIN, Icon. Règne An. 27, f. 1. ♂ ♀. MILNE EDWARDS, Ann. des Sci. Nat. t. xx. p. 385. Hist. des Crust. t. iii. p. 66. Règne An. edit. Croch. Crust. pl. lx. fig. 1. BRUZELIUS, Skand. Amph. Gamm. p. 15. WHITE, Cat. Brit. Crust. p. 55. Pop. Hist. Crust. p. 193, pl. xi. fig. 1.

Gammarus longicornis. FABRICIUS, Ent. Syst. ii. p. 515. RØMER, Gen. Ins. tab. xxxiii. fig. 6.

<i>Astacus linearis.</i>	PENNANT, Brit. Zool. Edit. 1777, iv. p. 17. pl. xvi. fig. 31.
<i>Oniscus volutator.</i>	PALLAS, Spec. Zool. ix. p. 59. tab. iv. fig. 9.
<i>Cancer grossipes.</i>	LINNÆUS, Syst. Nat. ii. p. 1055.

THIS species has the eyes small and round. The superior antennæ are about one-fourth of the length of the animal; the first joint of the peduncle has the inner margin crenulated. The inferior antennæ are very powerful, and in the male are longer than the animal itself; the penultimate joint of the peduncle being armed upon the inferior distal extremity with a strong tooth, which appears to assist considerably in holding any object when the extremity of the antennæ is folded upon itself; this organ appearing to possess the strongest prehensile power, and being no doubt used as a weapon of offence in its battles with other animals in its struggle for existence. The first pair of legs are not powerful organs, being simply subchelate. The second pair have the wrist as long as the hand, inferiorly dilated, and furnished with one or two longitudinal rows of long hairs; the hand is not so wide as the wrist, and is furnished near the carpal articulation with a diagonal row of long hairs; the finger is narrower than the hand, and is short, sharp, and slightly curved. The first two pairs of walking legs are moderately long, and terminate in long, straight fingers; the next two are short, and the last is nearly as long again as the two immediately preceding. The natatory appendages have the basal joints very short and broadly developed. The caudal appendages are also short, the last scarcely reaching beyond the extremity of the telson.

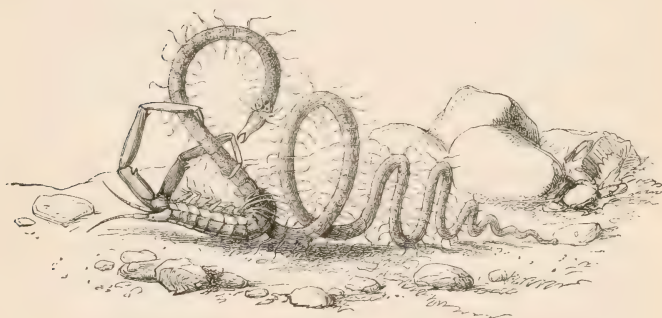
The colour of the animal is grey, mottled with black stellated markings, appearing to assimilate very nearly to the colour of the soil which it inhabits. It dwells in

small tubular galleries, excavated in the mud, over which the tide flows and ebbs. It has not, however, been ascertained whether the channels in the mud are perforated by these crustacea or by the numerous annelids that it preys upon. Quaterfages, in his pleasant "Rambles of a Naturalist," says, "that at about the end of April they come from the open sea in myriads (they are called *Pernis* by the fishermen of the coast of Saintonge) to wage war with the annelids, which they entirely destroy before the end of May; they then attack the mollusca and fish all through the summer, and disappear in a single night about the end of October, and return again the following year." It is one of these fierce combats with an annelid that we have represented in our vignette.

This species may probably be found all round the British coast, and it would be interesting if local naturalists should be able to confirm the information derived from the fishermen on the coast of Saintonge. We have taken several specimens in calm weather during the month of July, amongst weed attached to a buoy in Plymouth Sound, associated with *Podocerus*; but we have not, among the many that have been sent to us, received any remarks from our correspondents relative either to season or situation in which they had been found, and therefore assume their habitats to be as commonly reported.

They have been recorded or sent to us from Berwick by Dr. Johnson; from the Moray Frith, by the Rev. G. Gordon; from Norfolk and the mouth of the Medway, by Dr. Leach; and we have taken them in Loughor Marsh, Glamorgan. Quatrefages speaks of their abundance on the coast of Saintonge. Mr. D'Orbigny has recorded them from the Bay of L'Aiguillon, near

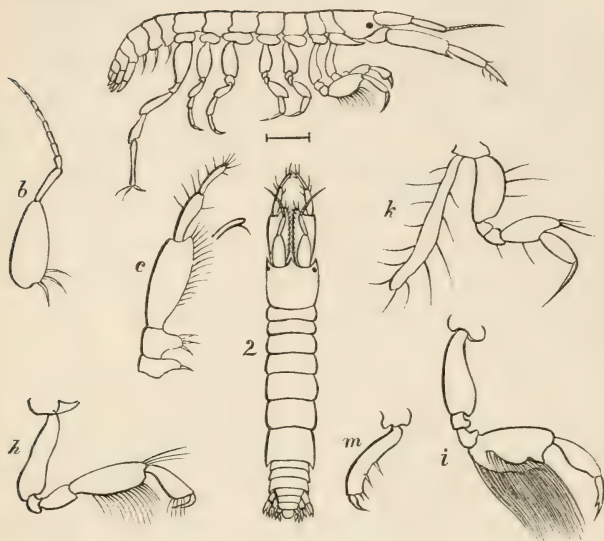
Rochelle; Brébisson on the coast of Calvados in France; Van Beneden on the shores of Belgium; and Bruzelius has found them on the coasts of Sweden and Norway. Some specimens, which we take to be the young of this species, we find in the collection sent to us by the Rev. A. M. Norman, taken in from two to five fathoms, in Outer Skerries Harbour, Shetlands.



COMBAT BETWEEN AN ANNELID AND COROPHIUM LONGICORNE.

AMPHIPODA.
DOMICOLA.

COROPHIIDES.



COROPHIUM BONELLII.

Specific character. Superior antennæ having the inner margin of the first joint of the peduncle smooth. Inferior antennæ scarcely half the length of the animal; penultimate joint of the peduncle having the inferior margin armed with several strong spines.

Length, $\frac{4}{20}$ inch.

Corophium Bonellii. MILNE EDWARDS, Ann. des Sc. Nat. t. xx. p. 385, Hist. des Crustacés, t. iii. p. 67.

Corophium spinicorne. SPENCE BATE, Cat. Amph. Brit. Mus. p. 281, pl. xlvii. fig. 5.

THIS species differs from the preceding in many points, some of which may, however, prove to be sexual. For a considerable time it was our belief that this was but the female of the preceding species; but not having found them commonly associated has induced us, at all events for the present, to describe such very different forms as distinct species.

The eyes are small and round. The superior antennæ

have the inner margin of the first joint of the peduncle smooth, armed near the base with three strong stiff spines; the second joint is narrower than the first, and about half as long; the third joint is very small; the flagellum is nearly as long as the peduncle. The inferior antennæ are scarcely longer than the superior, being about half the length of the animal; the second joint of the peduncle* is internally produced to a point, which is crowned with a short straight spine; the third joint is similarly produced internally, and crowned with three stiff spines; the fourth reaches to the extremity of the peduncle of the superior, it is as broad as the second, and anteriorly produced upon the inner side to a blunt point, the inner margin of the joint is furnished with stiff spines, those nearest the base are inserted at right angles, but gradually they diverge until the anterior ones are directed nearly straight forwards; the flagellum is uniarticulate, and tipped with several small spines. In other respects this animal bears a near resemblance to *C. longicorne*. This species seems so nearly to correspond with the character given by Milne Edwards of *C. Bonellii*, of unknown habitat, that we adopt that name for it, the term *spinicorne* having been previously appropriated by Mr. Stimpson for a Californian species.

It has been sent to us from Yarmouth, where it was taken by Mr. Jeffreys; and from Cumbræ, where it was found by Mr. Robertson. The Rev. A. M. Norman has also taken it in from two to five fathoms of water in Outer Skerries Harbour, Shetland. It has also been taken at Plymouth.

* The peduncle of the inferior antennæ in the *Amphipods* consists constantly of five joints, the first two are commonly closely united and frequently fused together; they are nevertheless to be regarded and counted as two distinct joints.

AMPHIPODA.

DOMICOLA.

COROPHIIDES.



COROPHIUM CRASSICORNE.

Specific character. Inferior antennæ having the penultimate joint of the peduncle armed with two teeth.

Length $\frac{1}{20}$ inch.

Corophium crassicorne. BRUZELIUS, Skand. Amph. Gam. p. 15, pl. i. fig. 2. SPENCE BATE, Cat. Amph. Crust. Brit. Mus. p. 228, pl. xlvii. fig. 6.

THE head is short, having a *small rostrum*. The eyes are situated upon an advanced lobe between the superior and inferior pairs of antennæ. The superior antennæ reach to the extremity of the penultimate joint of the peduncle of the inferior, which are about two-thirds of the length of the animal, very robust, and armed at the inferior distal extremity of the penultimate joint with two anteriorly-directed teeth, the outer one being the larger of the two. In other respects this species bears a near resemblance to *C. Bonellii*.

We have only seen two specimens of this species, one dredged by Mr. Jeffreys off the Shetlands, and one recently obtained by the Rev. A. M. Norman in Outer Skerries Harbour, in from two to five fathoms of water, which we regard as identical with that of Bruze-

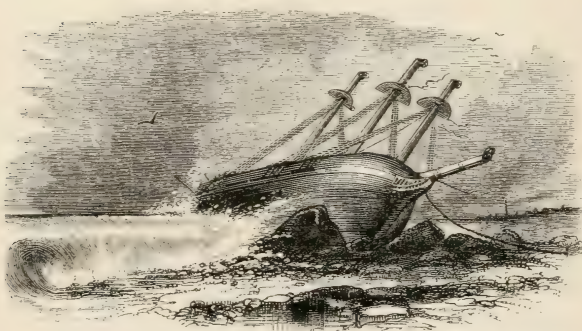
lius; but in our specimens the teeth which arm the inferior antennæ vary from those represented in the figure given by that author; the apex of the teeth reaching, in our specimens, rather beyond the extremity of the joint on the right, but not so on the left; there is also a small tooth on the fifth joint antagonizing with those on the fourth. There is also a strong process or blunt tooth upon the second joint of the left antennæ, but which appears to be less developed on the right. A few fine hairs exist upon the same antennæ, but in one of ours we only saw a few short stiff points; probably these were hairs, as long as those represented by Bruzelius, when the animal had but recently shed its exuvium, but which are now rubbed down by frequent use of the organ in grasping foreign substances. Bruzelius says that it is found on the coast of Norway from the most northern point to Bohusia, and is rare. The last three segments of the tail are very short and are fused together—a circumstance that has been previously pointed out by Bruzelius, and which a recent opportunity has enabled us to confirm.

*AMPHIPODA.**DOMICOLA.*

Fam.—CHELURIDÆ.

CEPHALON broad. Pereion not compressed. The three posterior segments of the pleon fused together. Telson, as well as the appendages of the cephalon and pereion, normal; those of the pleon abnormally placed.

This family was founded by Professor Allman for the reception of a single species, which possesses such peculiar conditions as to exclude it from all those that had been previously formed. It is distinguished from the COROPHIIDÆ by the fusion of the last three segments of the tail and the abnormal character of the caudal appendages.



WRECK ON SHORE.

AMPHIPODA.

DOMICOLA.

CHELURIDÆ.

Genus—CHELURA.

- Chelura*. PHILIPPI in WIEGMANN'S Archiv. 1839, and Ann. Nat. Hist. iv. pl. iii. fig. 5. ALLMAN, Ann. Nat. Hist. xix. p. 361. WHITE, Cat. Crust. p. 56. Pop. Hist. Brit. Crust. p. 202 pl. xi. fig. 2. GOSSE, Mar. Zool. i. p. 138. SPENCE BATE, Ann. Nat. Hist. 2 ser. vol. xix. p. 149. Cat. Amph. Brit. Mus. p. 285.
- Nemertes*. WHITE, Cat. Crust. Brit. Mus. 1847.

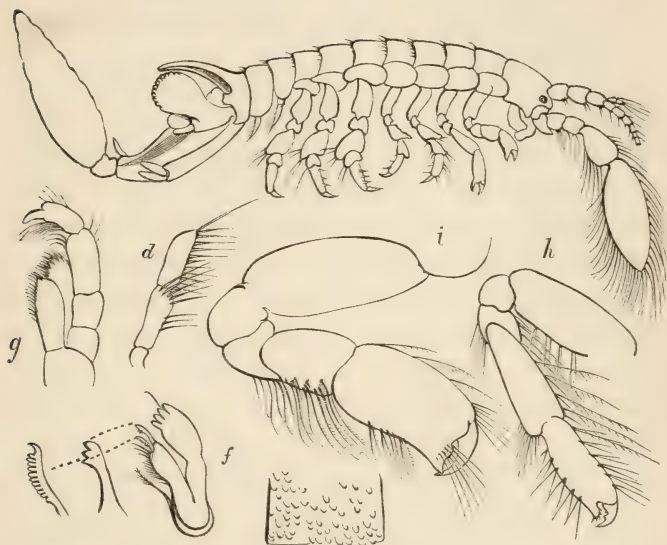
Generic character. Superior antennæ short, having a multi-articulate flagellum and a secondary appendage. Inferior antennæ longer than the superior; very robust; flagellum uniarticulate. Mandibles having an appendage. Third sia-gonopodos unguiculate. Gnathopoda chelate, subequal. Pereiopoda short, subequal. Ante- and penultimate pairs of pleopoda biramous, and closely associated; ultimate pair unibranchied. Telson single.

IN this genus the eyes are round. The superior antennæ are shorter than the inferior; they terminate in a multi-articulate flagellum, and bear a secondary appendage. The inferior antennæ are strong and have a uni-articulate flagellum of great size and strength. The mandibles are furnished with a three-jointed appendage. The maxillipedes terminate in a sharp finger. The first two pairs of legs have chelate hands. The coxæ are short; the legs are also short and strong. The ante- and penultimate pairs of caudal appendages are biramous, and closely associated in their position; the ultimate pair are single-branched, and the telson is single and squamiform.

This genus was first described by Philippi from specimens which he procured from the dockyards of Trieste.

AMPHIPODA.
DOMICOLA.

CHELURIDÆ.



CHELURA TEREBAKS.

Specific character. Third segment of the pleon posteriorly armed with a strong centro-dorsal tooth. Inferior antennæ nearly as long again as the superior. Gnathopoda not having the propoda dilated. Antepenultimate pair of pleopoda having the peduncle long, narrow, and rami short: penultimate having the peduncle developed into a broad and squamiform plate, the rami short: ultimate having the peduncle very short, and the ramus broad and very long. Telson pedunculated and broadly lanceolate.

Length—male $\frac{7}{20}$ inch, female $\frac{6}{20}$ inch.

Chelura terebans. PHILIPPI in WIEGMANN'S Archiv. vol. v. p. 120, pl. iii. fig. 5. (1839). ALLMAN, Ann. Nat. Hist. xix. p. 361, pl. xiii. 1839. WESTWOOD in Gard. Chron. 1849, p. 388, fig. sin. SPENCE BATE, Rep. Brit. Assoc. p. 59. Ann. Nat. Hist. 2 ser. xix. p. 149. Cat. Amph. Brit. Mus. p. 285, pl. xlvi. fig. 1. WHITE, Cat. Brit. Crust. p. 56. Hist. Brit. Crust. p. 202, pl. xi. fig. 2. GOSSE, Mar. Zool. i. p. 138, f. 250.

Nemertes nescioides. LEACH, MSS. WHITE, Cat. Crust. Brit. Mus. 1847, p. 90.

THE male animal in this species is a little larger than the female, and can readily be recognized by the greater length of the dorsal tooth, and that of the posterior pair of caudal appendages.

The third segment of the tail is armed with a large curved dorsal tooth, situated upon the posterior margin. The eyes are small and round. The superior antennæ are not longer than the peduncle of the inferior; the joints of the peduncle are subequal in length; and the flagellum, which consists of six articuli, is not quite so long as the peduncle; the secondary appendage is biarticulate* and slender. The inferior antennæ are about half the length of the body of the animal; the joints of the peduncle gradually increase in length and breadth, and are furnished with long hairs; the flagellum is of a long elliptic form, laterally compressed, and thickly fringed with long hairs in the male: it is smaller and rather more oval in the female. The first pair of legs have the hand scarcely dilated, the margins being nearly parallel, the palm straight, and little longer than the diameter of the hand, caused by the inferior angle being slightly produced inferiorly. The finger is short, sharp-pointed, and slightly curved, forming, with the hand, a tolerably perfect chelate organ. The second pair of legs have the hand somewhat longer, and still less dilated than that of the first, with the inferior angle of the palm anteriorly produced to a point, which, with the short and curved finger, forms a perfectly chelate hand. All the walking legs are short, and none have the thighs dilated: the last three have the hands strongly spinous upon their anterior margins. The natatory appendages are short; the multi-articulate flexible branches are fixed upon a

* Professor Allman figures it as four-jointed, the three terminal joints being very minute; it probably varies with age.

dilated peduncle which is as broad as long, and furnished upon the inner margin with two hooked spines and a few plumose cilia. The antepenultimate pair of caudal appendages have the peduncle long and narrow; the branches are short: the penultimate pair have the peduncle developed into a large thin plate, produced upon its inner margin to a breadth quite equal to its length; the branches are short, equal in length, the inner one being not quite so broad as the outer: the ultimate pair have the peduncle very short, but as if to compensate, the branch is greatly developed, being about the length of the inferior antennæ, and is very broad, especially near the base, and flattened. The middle tail-piece is of the form of a broad lance-head, attached to the animal by a short foot-stalk.

This species is one of our most injurious xylophagous Crustaceans. It is commonly found associated with *Limnoria lignorum*, but, fortunately for piles and other marine woodwork, it is not so prolific as that species. Its excavations, are, however, much larger and more rapidly executed. It is in fact so destructive that it will destroy a piece of Memel timber thirteen inches square in less than ten years. It works into the timber from the level of the mud to nearly the usual height of neap tides, avoiding, however, the knots of the wood. In this manner the wood is riddled in every direction, and is easily acted upon by the force of the water.

We have no doubt but that it excavates the saturated wood for the purpose of food; but we are unaware as to the manner in which the canals in which it resides are made. Our first impression is, that the mouth is the perforating organ, and the beautiful grooved surface of the under plate on the inner edge of the mandibles—carefully figured by Professor Allman in his elaborate

illustrations of this genus—leaves little doubt but that such is the case, although it might be thought that the large plumose antennæ would considerably interfere with the action of the mouth in working the progressive course of the tube. On the other hand the great and powerful antennæ cannot be used for the purpose of rubbing down the wood, or we should find evidence in the worn hairs at the extremity of the organ.*

We believe that the posterior pair of caudal appendages are important organs in assisting the animal to effect a retrograde movement when within its chamber. When free in the water its movements are very active, swimming chiefly on the back; and Professor Allman says that when out of the water it is capable of taking a considerable spring, the immensely-developed branch of the last pair of caudal appendages doubtless acting in the same manner as the fork of the *Poduridæ*.

It appears to us singular, that as the subject of the destruction of submarine architectural timber has been so much studied and examined for so many years, in an economical point of view, this animal, although so much larger than the well-known *Limnoria*, should not have been described until 1839, when it was found by Professor Philippi at Trieste. Some specimens, labelled Britain, in the collection of the British Museum, were obtained by Dr. Leach, but their locality has not been preserved, although supposed to have been taken by himself or Col. Montagu in Devonshire or Cornwall. Early in 1847 it was procured at Dublin in the piles of

* Being desirous of studying this subject, upon being placed upon the Committee "For Enquiring into the best Mode of Preserving Submarine Timber from the Ravages of the 'Teredo and other Animals,'" Mr. Spence Bate applied, through the Admiral Superintendent of the Dockyard at Plymouth, for permission to make some investigations in that naval arsenal, a favour which the Admiralty refused.

the jetty in Kingston Harbour, by Mr. Mullins, C. E., who gave an account of it in a paper read before the Institute of Civil Engineers, Ireland; from the same neighbourhood the late Mr. Robert Ball had obtained it some years previously. It has since been sent to us from Polperro, by Mr. Loughrin; from Falmouth, where it was found by the Rev. A. M. Norman, who, as well as Major Martin, and the Rev. Dr. Lansborough, found it in Ardrossan Harbour on the Ayreshire coast. We have taken it at the entrance of the Hamoaze, Plymouth. Mr. Thompson took it in Belfast Bay, and Mr. H. Pownall has sent it to us from the Southampton Water. It is, indeed, probably to be found associated with *Lim-noria*, all round the coasts of Southern and Western Europe, as well as the shores of North America.

Our friend, Mr. Townshend, who was recently sent by our Government to visit the dockyards of the West India Islands and North America, and who gave considerable attention to the ravages of animals upon submarine timber, informs us that the only wood which resisted the influence of these animals was that of the common Hemlock-tree of the country, and that only as long as the bark remained upon it: but we have recently been informed, by one of the engineers employed at Portland, that the creosoted timber of the jetty, which has existed there for upwards of twenty years, has received no injury from them.

END OF VOL. I.

